73 Amateur Radio Today

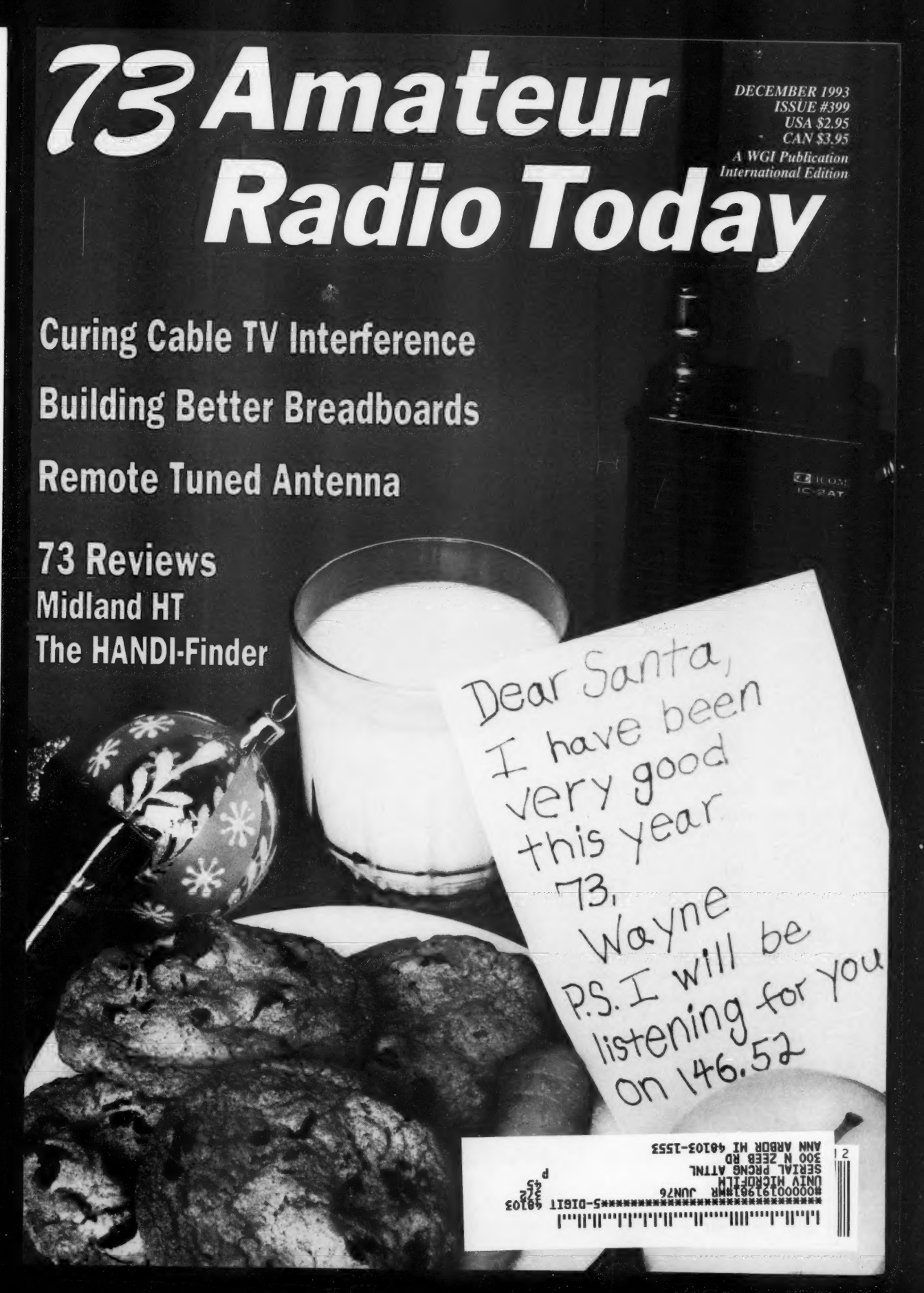
DECEMBER 1993
ISSUE #399
USA $2.95
CAN $3.95
A WGI Publication
International Edition

Curing Cable TV Interference

Building Better Breadboards

Remote Tuned Antenna

73 Reviews
Midland HT
The HANDI-Finder



*****5-DIGIT 48103
#00000191901RMR JUN76
UNIV MICROFILM
SERIAL PRCNG ATTNL
300 N ZEEB RD
ANN ARBOR MI 48103-1553

J.D. HEBE
KB7ROK
GRAND PRIZE WINN
OF A NEW IC-707!

Easy Access!

707 CONTEST WINNERS!

The Correct Country Names, clockwise from left were:

NEPAL

K BURKINA FASO

BHUTAN

COMOROS

KIRIBATI

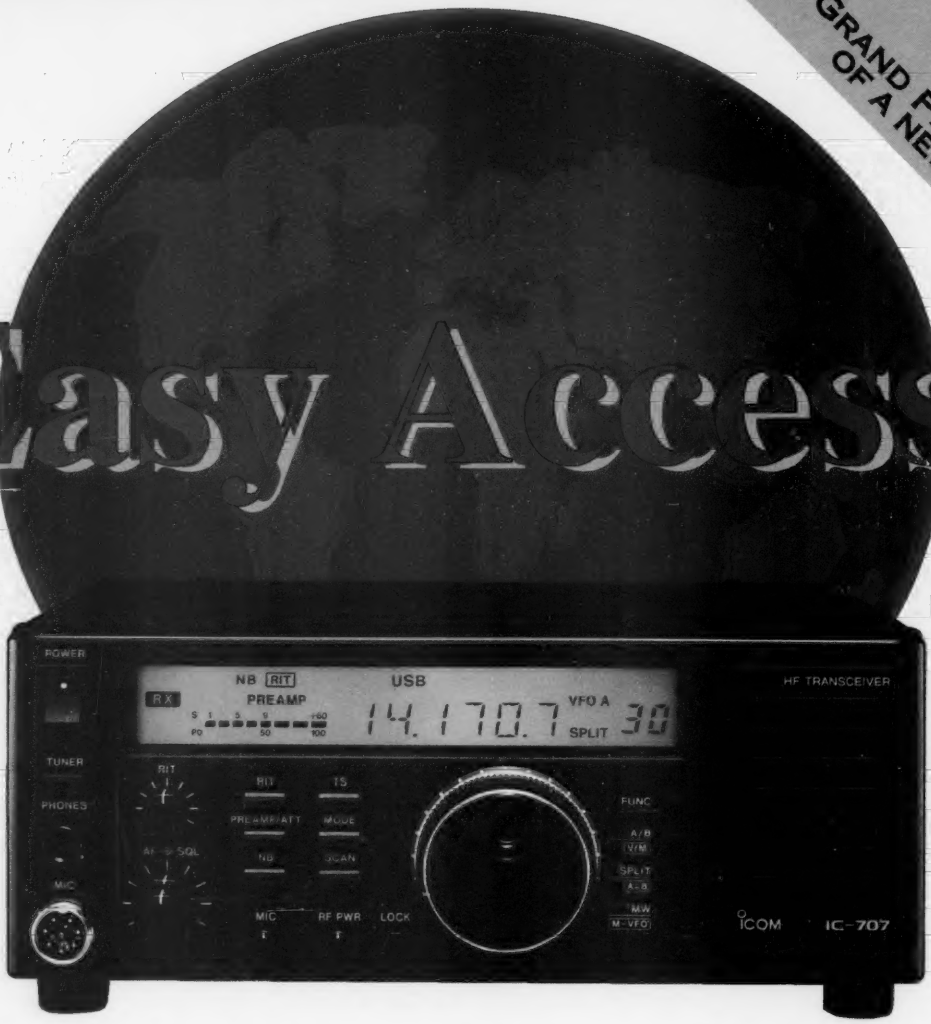
NAURU

QATAR

MADAGASCAR

TRINIDAD & TOBAGO

TUVALU



JACKET WINNERS

Gy. Sgt. DAVID BUMGARDNER, AB4VM

CHARLIE CHISHOLM K17NO

JIM CUSHING N1JMF

JOHN R. HERMANN W8TSF

TRACY HINO WH6HR

SCOTT MACKENZIE KBØFHP

JOHN PIEHL NJØV

DAVID STALL N5MKK

LARRY VOGT N4VA

MARC WOODWORTH

You know ICOM's philosophy: We *listen* before we build.

We designed the new **IC-707** after we listened to thousands of new operators around the world. They told us they wanted ICOM quality, but in an easy-to-use radio with just the basic functions.

Easy, we said.

The IC-707 is built to ICOM's relentlessly high standards, without expensive "extras."

- It has **easy to use** push-button functions
- An **easy to see** large LCD display that won't wash out
- An **easy to hear** front-mounted speaker for great audio in noisy environments
- It's **easy to transmit**— a stable 100W of output power is available at all times. In fact, after lab tests of "key down" operation for over 2 hours, the IC-707 was still at full power and within specifications
- Its compact design is great for **easy-going** mobile operations
- It's **easy to transport**, with a rugged metal case and solid internal construction
- And it's **easy on your budget** designed for anyone who wants to join a fascinating hobby with minimal investment in equipment.

IC-707. A basic radio designed for those who want the easiest introduction ever to ICOM performance and quality.

ICOM. Easy choice.

For additional information call the ICOM Brochure Hotline at

1-206-450-6088

All ham bands • 32 memory channels • Dual VFO • RIT • Noise blanker • Band stacking register General coverage receiver • Scanning • 10dB preamp • 20dB attenuator • USB, LSB, CW, AM, FM (optional) • 13.8VDC • 0.16μV sensitivity • -6/-60dB selectivity • -70dB image rejection • 10Hz frequency resolution • 9.4 (w) x 3.7 (h) x 9.4 (d) • 9.0 lb.

Also available: the **IC-77**. Similar operating features, but alphanumeric display, channel tuning and cloning capability.

ICOM America, Inc., 2380 116th Ave. N.E. Bellevue, WA 98004. All stated specifications subject to change without notice or obligations. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. The ICOM logo is a registered trademark of ICOM, Inc. 707/77E21093Y

ICOM

Experience the Quality

CIRCLE 179 ON READER SERVICE CARD

STARTEK INTERNATIONAL INC.
FREQUENCY COUNTERS

Made in USA

FIND FREQUENCIES FAST

With the new, high sensitivity, ultra-fast, Auto Trigger & Hold **STARTEK** frequency counters. Increase readability distance with the new Band Pass Filters. All products made in USA.

AUTO TRIGGER & HOLD

Now, for the first time, available on inexpensive, portable counters with our new *ATH™* Series. This feature is the most significant improvement ever made to the pocket sized counters! It allows "Hands Free" operation to automatically *read & hold* a signal as quick as 80ms or 8% of a second.

New ATH™ Series

Say goodbye to random counting & false readings with the ATH™ Series

WARRANTY
5 YEARS *all parts*
1 YEAR *labor*
ALL MODELS

TA-90 Antenna
(priced separately)

Introducing NEW ATH-50

HP-400
Band Pass Filter

ATH-15
1-1500 MHZ

ATH-30
1-2800 MHZ
One-Shot Feature

ATH-50
5 Hz to 2800 MHZ
One-Shot Feature

AUTO TRIGGER & HOLD - 1.5 GHZ COUNTER
ATH-15
AUTO TRIGGER & HOLD - 2.8 GHZ COUNTER
ATH-30
5 Hz to 2.8 GHZ FREQUENCY COUNTER
ATH-50
AUTO TRIGGER & HOLD
STARTEK INTERNATIONAL INC. FT. LAUDERDALE, FL USA

Ultra Bright Display

Signal Strength Bar Graph Works on Every Range

Low Battery Indicator

Size 4"h x 3.5"w x 1"d Aluminum Cabinets (No Self Tap Screws)

In Stock... Same Day Shipment!

ATH, Ultra High Sensitivity Frequency Counters			
ATH-15	1-1500 MHZ, High speed	*$199.*	$235.
ATH-30	1-2800 MHZ, High speed, one shot	*259.*	299.
ATH-50	5 Hz to 2800 MHZ, one shot	*289.*	339.
HST-15	Optional 0.2 PPM TCXO High Accuracy Timebase (installed)	*100.*	125.
Economy Frequency Counter			
1350	1-1300 MHZ, 10 HZ Res. 3 gate times, Hold switch	*$119.*	129.
Band Pass Filters			
	Increase range or distance from a transmitter with a Band Pass Filter. <1 dB pass band insertion loss.		
LP-60	DC-60 MHZ Usage		$69.
HP-400	400-1500 MHZ Usage		69.
HP-800	800-2000 MHZ Usage		69.
BP-3	Above 3 filters *(SAVE $30)*	*$177.*	207.
Accessories			
A *CC-90*	Case for all models		12.
B *TA-90*	Telescope BNC antenna		12.
C *TA-90-L*	Telescope elbow antenna		16.
D *RD-150*	150 MHZ rubber duck		16.
E *RD-2750*	27-50 MHZ rubber duck		28.
F *RD-800*	800 MHZ rubber duck		29.
G *M-207-IC*	Interface cable for MFJ-207		10.
H *P-110*	200 MHZ, 1x, 10x probe		39.
J *LP-22*	Lo-Pass, audio usage probe		25.
K *DC-10*	Direct, 50 OHM probe		20.

ATH™ SERIES FEATURES INCLUDE:

- Easy to use – simple controls
- Ultra fast response time
- Extra BRIGHT LED digits
- 3-5 hour battery operation
- Automatic clean dropout
- Maximized sensitivity, <1mV typical
- Signal strength Bar Graph
- 2 ranges – 6 fast gate times
- 9-12V auto-polarity power jack
- *StarCab™* aluminum cabinet

Ni-Cads and A/C Charger INCLUDED with ALL Models

1350
1-1300 MHZ

Factory Direct Order Lines
SAME DAY SHIPMENT

Orders Only **800-638-8050**
Orders & Information **305-561-2211**
FAX 305-561-9133

STARTEK INTERNATIONAL INC.
398 NE 38th St., Ft. Lauderdale, FL 33334

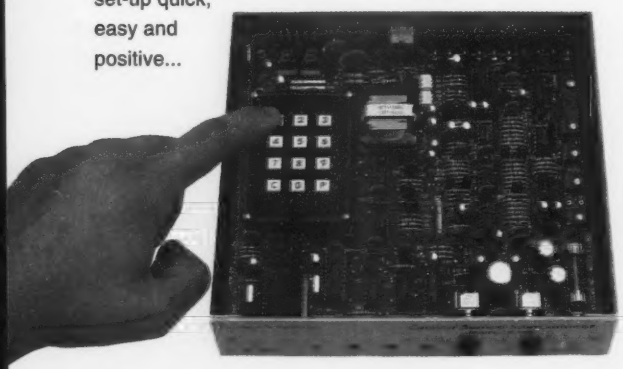
Terms: Ship/Hand charges for US & Can $10, others add 15%. FL residents add tax. C.O.D. $5. VISA, MC, Discover accepted. Prices and specifications subject to change without notice or obligation.

CIRCLE 247 ON READER SERVICE CARD

TURN your RADIO into a PHONE

Our microprocessor controlled interconnects patch your FM base station radio to your phone line and allow you to initiate and receive phone calls in your mobile or HT without assistance.

Only **CSI** interconnects offer important user friendly features such as Memory Speed-dialing, Last Number Redial and a built-in Programming keyboard with companion digital display which makes user set-up quick, easy and positive...



All features are fully user programmable: • Speed-dial memories • Single or multi-digit access code. • Secret toll override access code • Toll restrict numbers and sequences • Regenerated tone or pulse dialout • Ringout on 1-9 ring • Line in use detect • Call waiting • CW ID • Hookflash • Activity & Timeout timers... And More !

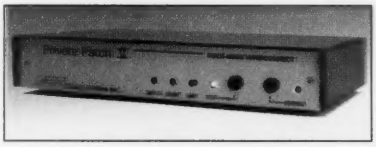
CSI has been the leading producer of interconnect products for over eleven years. All products are made in the U.S. A. and come with a one year limited warranty.

To get the complete story Call or Fax today for product information and dealer listing.

Connect Systems Inc.
2259 Portola Rd.
Ventura, CA. 93003
Toll free
(800) 545-1349
Phone (805) 642-7184
FAX (805) 642-7271

CSI is a registered trademark of Connect Systems Inc.

Private Patch V



Private Patch V is a multi-mode interconnect that offers four user selectable modes: 1. Enhanced Sampling 2. VOX Simplex 3. Semi-Duplex 4.Repeater Maker. A 90 memory speed-dialer and remote base mode are also included. Can be connected to the Mic and speaker jacks of any simplex transceiver when used in VOX simplex. Fully FCC and DOC approved. No other patch offers as many modes and features.

CS-900 Control Station Interconnect

The CS-900 is VOX activated and can be used simplex or through any remotely located repeater. The standard 1/2 Second Electronic Voice Delay totally eliminates syllable or word clipping and results in unsurpassed simplex performance. A 90 memory speed-dialer and Remote base mode are also included. The only required connections are to the Mic and Speaker jacks of your simplex transceiver. Fully FCC and DOC approved. This is the best deal going in a simplex patch!

CS-800 Full Duplex Interconnect

The CS-800 will operate Full or Semi duplex and also has a built-in Repeater Maker. The only required connections are to the Mic and Speaker jacks of your dual band transceiver. A 9 memory Speed-dialer is standard. Fully FCC and DOC approved. This is your best choice in a Full Duplex interconnect with built-in Repeater Controller!

CS-700 Intelligent Interconnect

The CS-700 is for simplex operation and offers selectable VOX Enhanced or VOX Controlled Sampling. Sampling allows the mobile operator to have positive control at all times. The CS-700 requires an internal connection to the discriminator of your simplex transceiver. A 9 memory Speed dialer is standard. This is the best sampling patch in the business!

CD-1 Communications Decoder Unit

Decodes and displays all 50 CTCSS tones, 104 DCS codes and all 16 DTMF digits when connected to any scanner, receiver or service monitor. Extremely useful for service work or determining the correct codes to operate open repeaters and autopatches. DTMF sequences are displayed a second time, slowly just in case the real time digits were too fast to comprehend.

CIRCLE 12 ON READER SERVICE CARD

73 Amateur Radio Today

December 1993
Issue #399

TABLE OF CONTENTS

FEATURES

10 Deluxe Communications Audio Board
Enhance your audio with this practical add-on. WD4PLI

18 Resolving 2 Meter/Cable TV Interference
A winning strategy for keeping the peace, and staying on the air!.....NM8R

28 Five-Element T-Match VHF Yagi
Excellent performance characteristics on 2 meters. .....KAØNAN

32 Remote Tuned Active Antenna
Tune this easy amplified antenna without leaving your chair. W2IMB

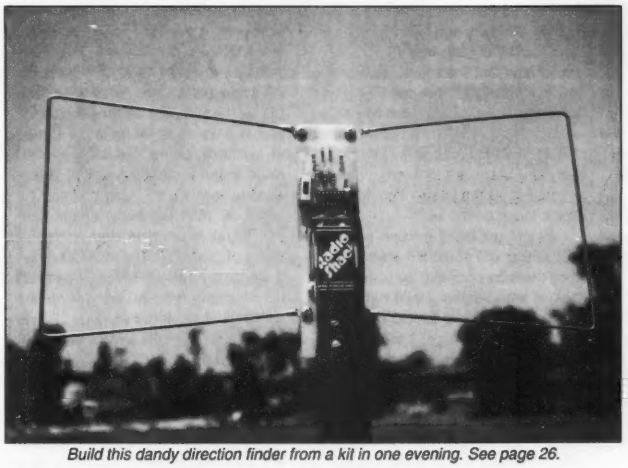
38 Melt Your Way to Better Breadboards
Discover the Macro Surface-Mount breadboard method. N1JIJ

42 Maxi-Loop 80
Here's a tried-and-true indoor favorite you can build. G2BZQ

REVIEWS

26 The HANDI-Finder
Build this versatile, accurate DFer semi kit in an evening.....W6KOW

34 Midland 73-005 Transceiver
A full-featured HT at an entry-level price.....WA1RZW



Build this dandy direction finder from a kit in one evening. See page 26.

DEPARTMENTS

70 Above and Beyond
81 Ad Index
74 Ask Kaboom
68 ATV
89 Barter 'n' Buy
56 Carr's Corner
82 Dealer Directory
17 Feedback Index
62 Hams with Class
50 Hamsats
60 Homing In
6 Letters
4 Never Say Die
88 New Products
66 Packet & Computers
96 Propagation
64 QRP
8 QRX
96 Random Output
53 RTTY Loop
76 73 International
87 Special Events
94 Uncle Wayne's Bookshelf
58 Updates

FEEDBACK... FEEDBACK!

It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 17. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

On the cover: A recently-discovered photo from the Green family archives.

THE TEAM

PUBLISHER/EDITOR
Wayne Green W2NSD/1

ASSOCIATE PUBLISHER/EDITOR
David Cassidy N1GPH

MANAGING EDITOR
Hope Currier

SENIOR/TECHNICAL EDITOR
Charles Warrington WA1RZW

EDITORIAL ASSOCIATES
Sue Jewell
Joyce Sawtelle

CONTRIBUTING EDITORS
Bill Brown WB8ELK
Mike Bryce WB8VGE
Joseph E. Carr K4IPV
David Cowhig WA1LBP
Michael Geier KB1UM
Jim Gray W1XU/7
Chuck Houghton WB6IGP
Arnie Johnson N1BAC
Dr. Marc Leavey WA3AJR
Andy MacAllister WA5ZIB
Joe Moell KØOV
Carole Perry WB2MGP
Jeffrey Sloman N1EWO

ADVERTISING SALES MANAGER
Dan Harper
ADVERTISING COORDINATOR
Judy Walker
1-603-924-0058
1-800-274-7373
FAX: 1-603-924-9327

GRAPHIC DESIGN
Suzanne Self

GRAPHIC SERVICES
FilmWorks, Inc.
Hancock NH

TYPESETTING
Linda Drew

CIRCULATION MANAGER
Harvey Chandler
To subscribe: 1-800-289-0388

WAYNE GREEN, INC.

Editorial Offices
70 Route 202N
Peterborough NH 03458
1-603-924-0058;
FAX: 1-603-924-9327

Subscription Services
1-800-289-0388

Foreign Subscribers
1-609-461-8432

Audit Bureau of Circulations **Member**

Reprints: $3.00 per article.
Back issues: $4.00 each.
Write to *73 Amateur Radio Today*, Reprints, 70 Route 202N, Peterborough, NH 03458.

Printed in the U.S.A. by Quad Graphics, Thomaston, Georgia.

FB

Editorial Offices
70 Route 202N
Peterborough NH 03458
phone: 603-924-0058

Advertising Offices
70 Route 202N
Peterborough NH 03458
phone: 800-274-7373

Circulation Offices
70 Route 202N
Peterborough NH 03458
phone: 603-924-0058

Manuscripts Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon publication. A premium will be paid for accepted articles that have been submitted electronically (CompuServe ppn 70310,775 or MCI Mail "WGEPUB" or GEnie address "MAG73") or on disk as an IBM-compatible ASCII file. You can also contact us at the 73 BBS at (603) 924-9343, 300—2400 baud, 8 data bits, no parity, one stop bit. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their Social Security number with submitted manuscripts.

73 Amateur Radio Today (ISSN 1052-2522) is published monthly by Wayne Green Inc., 70 Route 202 North, Peterborough NH 03458.

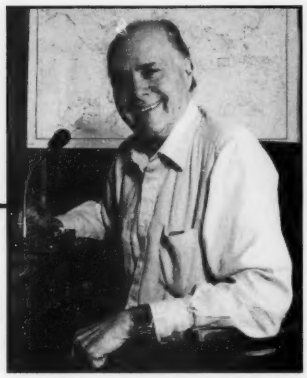
Entire contents ©1993 by Wayne Green Inc. No part of this publication may be reproduced without written permisson of the publisher.

For Subscription Services, write to *73 Amateur Radio Today*, P.O. Box 7693, Riverton NJ 08077-7693, or call 1-800-289-0388. The subscription rate is: one year $24.97, two years $39.97; Canada: $34.21 for one year, $57.75 for two years, including postage and 7% GST. Foreign postage: $19.00 surface or $42.00 airmail additional per year. All foreign orders must be accompanied by payment in US funds. Second class postage paid at Peterborough, NH, and at additional mailing offices. Canadian second class mail registration #178101. Canadian GST registration #125393314. Microfilm Edition—University Microfilm, Ann Arbor MI 48106. POSTMASTER: Send address changes to *73 Amateur Radio Today*, P.O. Box 7693, Riverton NJ 08077-7693.

Contract: You have stumbled into the pages of *73* magazine. You are now in our evil clutches! Now get to work on a home-brew project! We don't mean chugging frosty beers in the living room; we mean slinging solder. So, find a project you would like and get going.

NEVER SAY DIE

Wayne Green W2NSD/1



Spending Money is a Lot More Fun . . .

. . . than making it. That's the hard part . . . at least for most of us. So wouldn't you like all the guidance you can get to help you spend your money wisely? I really hate it when I get suckered, don't you? Well, you can help me and the rest of us who might blunder into some sucker bets by giving us the benefit of your experience . . . happy or sorry.

Here's the drill. Whenever you buy any ham product . . . a transceiver, HT, antenna, book, gadget, and so on, check it out carefully and then let me know how much you'd recommend it, on a scale of one to 10, as something you think the rest of us ought to buy. Give me your call, your recommendation, your age, and how long you've been a ham. You might send it on a QSL card, a page torn from your old spiral notebook, via the *73* BBS, CompuServe, MCI, fax, or whatever. No, never mind the whatever.

If you've bought one of the ARRL books, how is it? How about the new *CQ* videotapes? I was surprised at how good they are. What do you think? I'm still trying to decide what rig to get for my new ham shack and so far you haven't been a lot of help. Look, I tell you when I find things I enjoy and think are a good deal, so what's wrong with you reciprocating? I might even pass your rating along to help other readers get the most from their money.

One to 10, with one being absolute garbage . . . like a certain KV4 I could name . . . and 10 being heavenly bliss . . . like my Scott Kirby CDs of Joplin's music. By the way, 99% of you have disappointed me far beyond my ability to express myself . . . and you have to admit I'm pretty good at that . . . by not yet buying one of Kirby's Joplin CDs. I've thought it over carefully and decided that Scott Joplin was the most creative composer America has ever produced. Yes, he was black. What are you, a bigot? This came to mind because Volume 4 of "The Complete Joplin" is now available. This is the last of the series.

Just as I try to get you to enjoy all the different things we can do in amateur radio . . . things that I've enjoyed . . . I've been trying to get the readers of my *Secret Guide To Music* to try the music that I love the most. And I've been succeeding pretty well. I've gotten thousands of my readers into Joplin's incredible music, and even converted thousands of rock fans to enjoying classical music, too. Do you have a CD player yet? There must be some music you enjoy listening to. So get a player and take a little time to sit back and luxuriate in music that will help rebuild your psyche. Then try one of my Joplin CDs and see what happens to you.

I'm sure I've told you the story, but you've probably forgotten it. What happened was that when I saw *The Sting* around 20 years ago I loved the music and started buying every Joplin LP I could find. But the more I listened to them, the more I knew something was missing. They all sounded too much like a player piano. I wished my father hadn't been so against my learning to play the piano when I was young. I wanted to let the beauty I could sense in the music come out.

When I got into the music business publishing *CD Review* I started bugging the record companies to look for a pianist who played Joplin right. I got nowhere. They just looked at me funny. So late one night I was walking along a street in New Orleans, coming back from a riverboat jazz concert, when I passed a grungy little bar with piano music coming out the door. Joplin! I grabbed Sherry and stopped. Hey! We went in, sat down and had a couple Cokes. There was this young kid with a ponytail playing Joplin the way I'd heard it in my heart. After a couple hours of ecstasy I knew I was in the record business. Yes, I knew that 95% of all records lose money. I didn't care. People just had to hear this. It was a mission.

So we brought Scott Kirby to New Hampshire and recorded a CD of Joplin's music. Sherry found a nice old Steinway piano in the Peterborough Unitarian church, and by luck I had an experienced recording engineer working for me. We got Knud Keller KV4GG, who had been my bookkeeper for years, to keep the old piano in tune. Knud used to be a concert pianist in Stuttgart before getting practical. I paid him off with a new ICOM rig.

Kirby, 24, was an Ohio State graduate, with a good solid classical music background. But he loved Joplin's music so much he moved to New Orleans from Columbus, bought a piano, put wheels on it, and played Joplin's music every day on the streets. As far as I know, Scott is the only person in the world making a steady living playing ragtime. There are one or two chaps playing ragtime in the Disney parks, but they're part-time. Kirby turned out to be one of the nicest guys. Despite his stupendous talent, he's unassuming.

The church was a difficult place to record. Every time a truck went past on Route 202 Scott had to stop and start over again. He and David Torrey, the engineer, got to recording after midnight to avoid these interruptions. So when we wanted to do a second CD we had Knud look for a better piano, one we could set up in the garage at my farm, using that as a studio. Knud found a wonderful 1898 Steinway upright. Great sound. Then he found an 1896 Bradbury upright concert grand, which was even better for some of the rags. The Steinway was great for the concert pieces. David set up sounding boards to liven up the garage and Scott did another CD. He liked the new pianos so well we decided to start this new CD as Volume 1 of a set of four CDs of the "Complete Joplin" rags, marches and waltzes.

About this time Phil Martus, from the circulation department, got to helping clean out my barn. He did a marvelous job. I looked at the huge space he'd cleared and thought we had room to build a recording studio. David designed it and Phil, with his brother Greg, built it. The end result was something you ought to see if you ever get up this way. It's state-of-the-art digital. Artists who've come here from all over the world to record tell me it's the finest studio in the country. Scott did Volumes 2, 3, and 4 in the new studio.

Now that he's done all of Joplin's music he'll be coming up to record some good rags by other composers. But most of all I want you to hear the wonderful rags that Scott's written.

Since appearing on my Greener Pastures Records, Scott has been invited to play at the major ragtime festivals around the country. He's knocked 'em dead! When he finishes playing there's a silence and then the audience gives him a standing ovation. No one else gets that, and there are some famous ragtime performers at these shindigs. If I get you hooked on ragtime, which I hope I can, you may be getting together with me at festivals in Sedalia in June, Boulder in July, and Fresno in November.

I hope you'll excuse me for coming on like this, but since most of you have been reading my stuff for years, I think of you as friends I write to every month, not as subscribers. So I share my enthusiasms and frustrations with you. I haven't told you, but when you take the time to write back, I enjoy reading what you've got to say. I try to answer, when I can, but I can't answer everyone. In my music magazine I ask my readers to let me know if they find a CD which they think I'll enjoy . . . and I do the same for them.

So that's why I'm after you to try your hand at 10 GHz, where I had so much fun making contacts with Chuck Martin WA1KPS in seven different states. That was so exciting I didn't want you to miss out. Ditto if you can make it on a DXpedition somewhere. These are things you'll remember the rest of your life with pleasure.

That's one thing I like about music . . . once you get a record you'll always be able to enjoy it. Don't get me started! I feel the same way about books. Hey, you really ought to read this one! Well, I can't get you into my living room and play my favorite CDs for you or walk you through my library, pointing out the books that are the most fabulous. I can't even get out my slides and show you how exciting it was to visit and operate from Sabah or New Caledonia. But maybe I can get you to try your hand at some satellite contacts. And how about getting geared up for some 2m aurora contacts this fall? I guarantee you'll never forget one single contact! And if I can get you to subscribe to my music magazine, we can share our music tastes. I'll try to get you tuned into Delius, Glière, Ippolitov-Ivanov, and a few more. But my first try will be Joplin. Maybe I'll get you to buy the boxed set of four CDs for $60. Probably not. But you should.

I bought my first record when I was around 12. Strauss waltzes. RCA Red Seal. Cost a buck for 10 minutes of music. That's around $20 in today's dollarettes. Now you can buy a superb 60 minutes of music for around $15. I've been putting out samplers for $3.79, just to cover the postage and handling, each with an hour of wonderful music. I've over a hundred of 'em available. They're all listed in my *Secret Guide*. Each has about 15 of the best-rated tracks from recently released independent record company CDs. This is one of the best ways to shop for new CDs. There's nothing like hearing the music to know whether you're going to want to invest $15 in a CD.

Oh, I forgot. I got all wrapped up in

Continued on page 80

YAESU

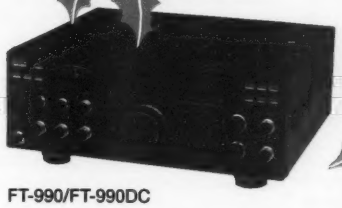
HOLIDAY SPECIALS

$100.off

FT-1000D/FT-1000

Plus Special Bonus Limited Edition Embroidered Jacket ($169.00 Value)

GOOD OCT. 15 1993 THROUGH JAN. 10 1994



FT-990/FT-990DC

$50.off

$35.off

FT-890AT/FT-890

FT-767GX, FT-736R

FT-840

FT-747GX

FT-5100

FT-5200/6200

FT-530 FT-470

G-2700SDX
G-1000SDX
G-800SDX

$25.off

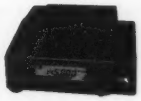
FT-416/816

FT-411E

$15.off

FT-2400H

FT-2200



CUSTOMER: Surrender this coupon at time of purchase to your authorized Yaesu dealer for discount. Limit one coupon per purchase. Coupon is non-transferable and can be only used for products as advertised in this ad and for the discounts as stated. Offers only good at authorized U.S. and Canadian Yaesu dealers. **DEALER:** Send this coupon along with a copy of sales receipt to YAESU U.S.A., Sales Dept., 17210 Edwards Rd., Cerritos, CA 90701.

CHECK BOX

- ☐ $100 OFF — FT-1000D/FT-1000 FREE also with purchase of FT-1000D or FT-1000, Limited Edition Embroidered Yaesu Jacket. Dealer will provide redemption coupon for jacket.
- ☐ $ 50 OFF — FT-990DC/FT-990
- ☐ $ 35 OFF — FT-890AT/FT-890, FT-840, FT-767GX, FT-736R, FT-747GX
- ☐ $ 25 OFF — FT-5100, FT-5200/6200,FT-530, FT-470, G-2700SDX, G-1000SDX, G-800SDX
- ☐ $ 15 OFF — FT-2400H, FT-2200, FT-416/816, FT-411E

MODEL PURCHASED _____ SERIAL NUMBER _____

DATE OF PURCHASE: _____

YOUR NAME: _____

ADDRESS: _____

CITY, STATE, ZIP: _____

PHONE: _____ CALL SIGN: _____

DEALER NAME/STATE: _____

Coupon offer valid in USA and Canada only. Offer void where prohibited by law. Coupon has no cash value. Limit one coupon per purchase. Not valid with any other Yaesu offers or discounts. Offers not applicable to purchases made prior to October15, 1993 or after January 10, 1994.

COUPON VALID FOR PURCHASES MADE BETWEEN OCT. 15, 1993 AND JAN. 10, 1994.

LETTERS

Number 2 on your Feedback card

From the Hamshack

William W. McConnell KD4UUB, Clover SC I live in a region where thunderstorms are frequent, sudden, and severe. I'm concerned about providing adequate lightning protection for my ham shack; however, I find that the ham literature on the subject is superficial and not very helpful.

I sent for and received the catalog from Poly Phaser Corporation, a *73* advertiser, and was delighted to find it contains lots of good information about lightning protection/grounding systems and about their products. But their information is aimed primarily at large commercial installations which are, undoubtedly, the source of most of their business.

My suggestion is that *73* commission an expert in the protection/grounding field to prepare a comprehensive article (or series) on this vital subject. I envision that the article(s) would cover the current technology and would be written specifically to cover a typical ham station.

Perhaps *73* would publish this up-to-date information on protection/grounding systems that will be definitive for ham applications.

Bill—Coincidentally, the September issue of Radio Fun *features an article on the fundamentals of lightning, including dos and don'ts for the average ham and a book review for those seeking more information. This may not answer* all *of your questions, because lightning is still not* completely *understood, but I hope it helps you . . . Charlie WA1RZW*

Harvey A. Nelson N9FHO, Madison WI Wayne—OK, here's the check for my renewal.

I usually agree with most of what you have to say regarding our hobby. One instance where I disagree with you (and most of the amateur community) is on the 14.313 MHz issue. You tend to view things from the perspective of an entrepreneur (you're a good one!) . . . cost/benefit ratios, market analysis, perceived value, image, product development, etc. I work in a hospital (I'm not an MD) and tend to view issues in terms of treatable/non-treatable disease.

Suppose that your community was experiencing some sort of infectious epidemic. Suppose that doctors and public health officials tell you that there is no cure for the disease but that it can be localized and contained in a very limited area . . . say a little island in the middle of a river that runs through your town. Would you be willing to sacrifice that little island for the good of the greater community? Are you willing to accept a leper colony in your midst?

My answer, in this instance, is an emphatic YES! What we have on 14.313 MHz is a spot where a good portion of the "crazies" have decided to collect themselves. Without prodding from the rest of us, they have found their fellows and are busily feeding on one another. That leaves the rest of the band open for our more pleasurable activities. There should be one such frequency on every band. We can avoid being "infected" by using our receivers properly . . . a trick I learned in my old TV-watching days: The big knob changes the channel and one of the little knobs usually turns it off. (We might include this bit of knowledge in the Extra Class question pool!)

You and I, in laissez-faire fashion, need not concern ourselves with what others choose to listen to, but with making our own conversation interesting enough to attract our own following . . . hoping that our insightful questioning will add to our own stores of knowledge.

But what about the youngsters? The 12- and 14-year-olds we hope to attract? Don't we have some responsibility for them? We must protect their tender ears, if not their minds . . . right?

Baloney! Those 12- and 14-year-olds, each and every one, has at least a parent who has taken on that responsibility . . . if not willingly, then by force of law. Our *obligation* in their nurturing is to pay our taxes to provide for their schools and to avoid hitting them with our automobiles when their parents allow them to play in the streets! Nothing more.

The parent must play as much a part in the kid's newfound hobby as the kid. The parent has the responsibility for knowing what is happening on 14.313 and monitoring his/her child's activities . . . the same responsibility they have for monitoring what books and magazines the kid reads and what movies and TV programs the kid watches (hopefully not many!). When the kid blunders onto the frequency, the parent will have to explain what the "cancer" is all about and how to cope with it.

You might want to provide parents with the insights they will need (as a part of your business venture). How about sending a nice letter/pamphlet to the *parents* of the newly licensed young ham, explaining some of the more *unattractive* aspects of our hobby, along with complimentary copies of your rags? After all, mom and dad are most likely paying for the kid's magazine subscriptions.

For my own part, I will encourage youngsters to begin their ham careers in digital modes . . . there ain't no backspace key on a tongue or microphone.

The only problem with that, Harv, is to figure out how we can keep the FCC Commissioners from hearing the baloney on 313, and thinking that we're all like that . . . Wayne.

Fred Carmichael KD4ATW, Chattanooga TN Reading Wayne Green's "Never Say Die" columns in August and September, and David Cassidy's "Random Output," has encouraged me to voice my opinion of the No-Code Tech license and the license procedure.

I am 47 years old and ever since I was 12 years old I wanted to be an amateur radio operator. I took the test the first time when I was 12 years old, and have taken it four times since. Each time I failed because of not being able to receive the code. However, two-and-a-half years ago I passed the No-Code Tech. I have had a great time since, operating 2 meters, 70 cm, and packet. I enjoy packet the most because it involves three of my loves: amateur radio, computing, and bulletin board systems. If it weren't for the No-Code Tech, I would not be writing this letter. I am currently working towards my General, but once I pass I will only use the voice bands, not CW.

We need young people in our ranks of amateurs. Young people are not interested in learning code, but most are interested in computers and other digital modes.

I agree with both Wayne and David in that we need to change the license structure and testing requirements if amateur radio is to survive. I suggest that we have two classes of licenses. The first would be for 10 meters and below; the second for all above 10 meters. We could call the first class "Amateur" and the second "Amateur Extra." To take care of all the old folks who like relics (code), we could do like the present system: Tech and Tech Plus. Next we would need to change the test to cover the FCC rules: operating practices, and how to properly use your radio equipment. The code side of the test would be optional, with 5 wpm for Amateur Plus and 13 wpm for Amateur Extra Plus. This way, if you wanted to use the relic, you could take the optional code test to get you Plus. Code would not be a requirement.

I have read articles and heard everyone talking about amateurs needing to change, getting younger people involved, and moving into the 21st century and not clinging to the past. I also know that making the changes I have suggested would require some changes internationally, but why not make these changes?

Peter A. Bergman NØBLX, Brainerd MN Wayne—I agree completely that something is wrong with education in America. We have "Honor Students" who cannot find their town on a map and have trouble with arithmetic, forget trig or calculus.

Much of the problem comes from the fact that "fashion" sweeps through the educational establishment and, once in vogue, some of the ideas are almost impossible to dislodge. Currently, it is considered nasty to make kids memorize. This bit of nonsense has been around long enough that memory skills and the teaching of them is almost a lost art.

Another educational jewel is called "process not product." The followers of this one believe that if children are taught how to think—always an admirable goal—they will derive the facts for themselves. Rather like making bricks with straw, not clay. If you want a challenge, try teaching science out of a "P not P" textbook.

I enjoyed your thoughts on getting something for our foreign aid. Why not use the idea a little closer to home? Let's buy Haiti—if we can figure out who the government is. It would give us a place for an open market enclave close to the US, also perhaps a location for a large HIV sanitarium and save the Haitians wishing to live in the US a dangerous boat trip.

By the way, I have a college degree in education. I'm also dyslexic and have ADD. Sr. Mary Margaret didn't know about them so she just made me work harder instead of giving me an excuse for failure.

I don't teach anymore; I drive a cab for the handicapped. It's less frustrating.

Lavee Israel 5NØSVL/4X1UF, Lagos Nigeria Wayne—It's a pleasure to read your magazine after a pause of several years. I especially love to read your editorials, and I like them very much. In most cases I agree with you 100%. It is a pity, however, that people are so narrow-minded and stubborn, especially when they have to dictate to others what to do.

For the past two years, the recession in Israel has pushed me to do business in Nigeria, where I deal with commercial two-way radio, combining it with my hobby, operating as 5NØSVL. We are trying very hard to help as many youngsters as possible to join the hobby and I would like especially to mention Kunle 5NØOBA, Peete 5NØCEP and Musa 5NØSAI. If we need contributions of used radio gear, Peete tries to help us. If it's for VHF repeaters, we keep trying, sometimes in a hostile environment . . . but usually we are able to accomplish the goal. Your editorial from August is encouraging because it points out that we need to bring in as many young people as possible because this is the future, and not only in Nigeria. It applies to Jordan as well as to Israel, too, since that government is making the same mistakes. Maybe the only one doing it the right way is Japan, as you mentioned.

There are many club stations in Nigeria, and we have a weekly net every Sunday morning at 0800 on 7065 kHz. What we are trying to do is find as many surplus SSB radios as possible so those clubs can operate on this frequency.

It is very good to read your excellent magazine again. Keep up the good work and keep saying the right things. 73

Low Cost GaAsFET PREAMPS

LNG-(*)

ONLY $59
wired&tested

FEATURES:
- **Very low noise:** 0.7dB vhf, 0.8dB uhf
- **High gain:** 13-20dB, depends on freq
- **Wide dynamic range** - resist overload
- **Stable:** low-feedback dual-gate FET

**Specify tuning range: 26-30, 46-56, 137-152, 152-172, 210-230, 400-470, 800-960 MHz.*

LNW-(*) MINIATURE PREAMP

ONLY $29 kit, $44 wired&tested

- GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

**Specify tuning range: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, 400-500 MHz.*

LNS-(*) IN-LINE PREAMP

ONLY $89 kit, $119 wired&tested

- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

**Tuning range: 120-175, 200-240, or 400-500.*

HELICAL RESONATOR PREAMPS

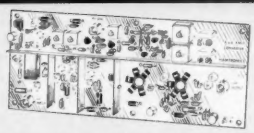
- GaAs FET preamps with 3 or 4 section helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRG-(*), *$80 vhf, $110 uhf.*** **Specify tuning range: 142-150, 150-162, 162-174, 213-233, 420-470.*

RECEIVING CONVERTERS

Low noise converters to receive vhf and uhf bands on a 10M receiver.

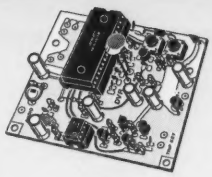
- **Kit less case *$49*, kit w/case & BNC jacks *$74*, w&t in case *$99*.**
- Input ranges avail: 50-52, 136-138, 144-146, 145-147, 146-148, 220-222, 222-224 MHz, 432-434, 435-437, 435.5-437.5, and 439.25 (to chan 3).

TRANSMITTING CONVERTERS



XV2 for vhf and XV4 for uhf. Models to convert 10M ssb, cw, fm, etc. to 2M, 220, 222, 432, 435, and atv. 1W output. ***Kit only $89.*** PA's up to 45W available.

ACCESSORIES



NEW DVR-1 DIGITAL VOICE RECORDER Module. Primarily a **voice ID'er for repeaters**. May also be used as a **contest CQ caller** or as a **"radio notepad"** to record up to 20 seconds of received transmissions for instant recall. As a **repeater ID'er,** it will record your voice, using either the built-in microphone or an external mic. It can be used with almost any repeater COR module. As a **contest caller,** you can record a message or even several messages and play them through your transmitter at the press of a switch. As a **radio notepad,** you can keep it wired to the audio output of a receiver ready to record up to 20 seconds of anything you might want to recall later. Play it back as many times as you like through a small external speaker. (Call for more information.) .....kit $89, w&t $139

TD-3 SUBAUDIBLE TONE DECODER/ENCODER. Adjustable for any tone. Designed **especially for repeaters,** with remote control activate/deactivate provisions ....kit $29, wired & tested $69

COR-3 REPEATER CONTROLLER. Features adjustable tail and time-out timers, solid-state relay, courtesy beep, and local speaker amplifier ..... kit $49

CWID. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 ..... kit $59

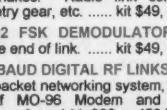
COR-4. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call ..... kit $99, w&t $159

TD-2 TOUCH-TONE DECODER/CONTROLLER. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! .....kit $89, wired & tested $149

NEW TD-4 SELECTIVE CALLING Module. Economy touch-tone decoder with 1 latching output. Primarily designed to mute speaker until someone calls you by sending 4-digit tt signal but may also be used to turn on autopatch or other device..... kit $49, w&t $89

AP-3 AUTOPATCH. Use with above for repeater autopatch. Reverse patch and phone line remote control are std. .....kit $89, wired & tested $149

AP-2 SIMPLEX AUTOPATCH Timing Board. Use with above for simplex operation using a transceiver ..... kit $39



MO-202 FSK DATA MODULATOR. Run up to 1200 baud digital signals through any fm transmitter with full handshakes. Radio link computers, telemetry gear, etc. ..... kit $49, w&t $79

DE-202 FSK DEMODULATOR. For receive end of link. ..... kit $49, w&t $79

9600 BAUD DIGITAL RF LINKS. **Low-cost** packet networking system, consisting of MO-96 Modem and special versions of our 144, 220 or 450 MHz FM Transmitters and Receivers. Interface directly with most TNC's. Fast, diode-switched PA's output 15 or 50W.

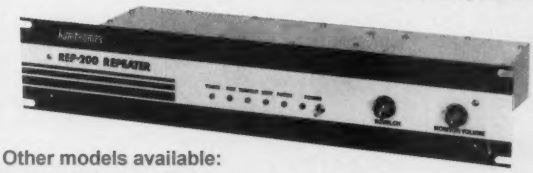
NEW **Real-Speech Voice ID Option Available With DVR-1 Digital Voice Recorder Shown At Left!**

REP-200 REPEATER

A microprocessor-controlled repeater with autopatch and many versatile dtmf control features at less than you might pay for a bare-bones repeater or controller alone!

We don't skimp on rf modules, either! Check the features on R144 Receiver below, for instance: GaAs FET front-end, helical resonators, sharp crystal filters, hysteresis squelch.

Kit $1095; w&t only $1295!
Voice ID Option $189.



Other models available:

REP-200V Economy Repeater. As above, except uses COR-4 Controller without DTMF control or autopatch. **Kit only $795.**

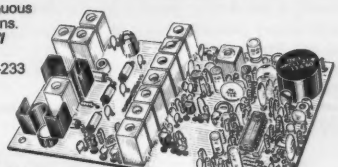
REP-200N Repeater with no controller. For use with external controller, such as those made by ACC. **Kit only $695, w&t $995.**

- Available for the 50-54, 143-174, 213-233, 420-475, 902-928 MHz bands.
- *FCC type accepted for commercial service (hi-band and uhf).*
- **Rugged exciter and PA**, designed for continuous duty.
- Power out 20W 50-54MHz; 15W (25W option avail.) 143-174MHz; 15W 213-233 MHz; 10W uhf; 10W 902-928MHz.
- Available add-on PA's **up to 100W.**
- **Six courtesy beep types**, including two pleasant multi-tone bursts.
- **Open or closed access autopatch, toll-call restrict**, auto-disconnect.
- **Reverse Autopatch,** two types: auto-answer or ring tone on the air.
- Pulse (rotary) dial option available.
- **DTMF CONTROL:** over 45 functions can be controlled by dtmf command. 4-digit control code for each function.
- **Owner can inhibit** autopatch or repeater, enable either open or closed access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr, and other options.
- Cw speed and tone, beep delay, tail timer, and courtesy beep type **can be changed at any time** by owner password protected dtmf commands.
- **Auxiliary receiver input** for control or **cross linking repeaters.**
- Many **built-in diagnostic** and testing functions using microprocessor.
- Color coded **LED's indicate status** of all major functions.
- **Welded rf-tight partitions** for exciter, pa, receiver, and controller.
- 3½ inch aluminum rack panel, finished in eggshell white and black.

XMTRS & RCVRS FOR REPEATERS, AUDIO & DIGITAL LINKS, TELEMETRY, ETC.

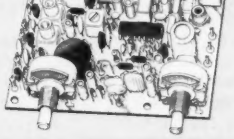
Also available in rf-tight enclosures, and with data modems.

FM EXCITERS: 2W continuous duty. TCXO & xtal oven options. ***FCC type accepted for com'l high band & uhf.***



- **TA51**: 50-54, 143-174, 213-233 MHz ...kit $109, w&t $189.
- **TA451**: 420-475 MHz ...kit $109, w&t $189.
- **TA901**: 902-928 MHz, (0.5W out); w&t $219.
- **VHF & UHF AMPLIFIERS.**
- For fm, ssb, atv. Output levels from 10W to 100W. Several models starting at $99.

FM RECEIVERS:



- **R144/R220 FM RECEIVERS** for 143-174 or 213-233 MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift. ...kit $149, w&t $219.
- **R451 FM RCVR,** for 420-475 MHz. Similar to above. ...kit $149, w&t $219.
- **R901 FM RCVR,** for 902-928MHz. Triple-conversion, GaAs FET front end. ...$169, w&t $249.
- **R76 ECONOMY FM RCVR** for 28-30, 50-54, 73-76, 143-174, 213-233 MHz, w/o helical res or afc. ...Kits $129, w&t $219.
- **R137 WEATHER SATELLITE RCVR** for 137 MHz. Kit $129, w&t $219.

- **Buy at low, factory-direct net prices and save!**
- **For complete info, call or write for free catalog.**
  Send $2 for overseas air mail.
- **Order by mail, fax, or phone** (9-12 AM, 1-5 PM eastern time.)
- **Min. $5 S&H charge** for first pound plus add'l weight & insurance
- **Use VISA, Mastercard, check, or UPS C.O.D.**

OUR 30TH YEAR!

hamtronics, inc.
65-D MOUL RD. — HILTON NY 14468-9535
Phone 716-392-9430 — FAX 716-392-9420

QRX . . .

Government Launches PCS Era

The Federal Communications Commission has allocated 160 MHz for the new PCS (Personal Communications Service) in the 2 GHz band. The decision is expected to spark intense competition to deliver wireless services.

The FCC plans to use auctions to award PCS licenses. Local telephone companies are seen as the big losers in the decision. The new PCS service will compete with the cellular telephone industry and will carry data, video, and voice transmissions.

What this will mean to the future of ham radio is anyone's guess. Some are already speculating that PCS will be to the 1990s what the cellphone was to the 1980s. One lightweight portable communicator could soon serve you at home, at work, and in your car. Your phone number would follow you wherever you go. The system can deliver reliable communications to portable phones, FAX machines, and pocket computers.

The Clinton Administration hopes to generate as much as $10 billion for the treasury from frequency auctions. By the year 2010, 60 million subscribers could generate up to $40 billion in revenue. *TNX Electronic Engineering Times, Issue 765, Sept. 27, 1993, and W5YI Report, Issue 19, October 1, 1993.*

ICOM Is Dealing

ICOM America is for the first time offering discount coupons for a variety of products that complement ICOM radios. Anyone purchasing a new ICOM radio between now and December 31, 1993, will receive a book of 32 coupons from 21 leading manufacturers who sell products and accessories.

ICOM's Chris Lougee says, "Virtually every time someone buys a new radio, they need additional components to go with that radio. ICOM is taking a leadership position in identifying complementary products and making arrangements to sell those products to consumers at a significant discount. We believe it will broaden the appeal of amateur radio."

High-Tech Highway

The Clinton Administration's Information Superhighway Plan is starting to take shape. The NTIA (National Telecommunications and Information Administration) will be given the lead role in its formation. The government's strategy calls for competing multiple cable, telephone, and computer networks.

Commerce Secretary Ron Brown will steer an industrial advisory council. You can expect major modifications to existing cable legislation and telephone restrictions. *TNX W5YI Report, Issue 19, October 1, 1993.*

Confirmation Likely

Communications attorney Reed Hundt is expected to be confirmed as the new FCC Chairman. Hundt was well received in his initial confirmation hearing before the Senate Commerce, Science and Transportation Committee.

The 45-year-old Hundt is a partner in the Washington law firm of Latham & Watkins, and he enjoys the friendship of Vice President Al Gore. Hundt has supported increased competition in the telcom industry and universal access to new information technologies overseen by the FCC. *TNX Electronic Engineering Times, September 27, 1993.*

Canada Loves Its Hams

A seven-page full-color spread titled "Loud and Clear" graced the pages of *Canadian Geographic* magazine's September/October issue. The feature article paints a sparkling picture of amateur radio operation in the Dominion.

The story was written by Janice Hamilton VE2JHJ and photographed by husband Harold Rosenberg VE2HRP. Rosenberg says, "I feel that spreading the good word about ham radio is very important, especially in the mainstream press." *TNX ES FB VE2HRP, VE2JHJ, and The Royal Canadian Geographical Society.*

Technical Opportunities Knock

There will soon be far fewer opportunities for blue-collar workers, and a lot more for those who posess technical expertise, according to an expert quoted in *Electronic Engineering Times.* Dennis A. Swyt, a technical manager at the Institute of Standards Technology, painted a picture of an America where engineers and skilled technicians will gain influence and power.

Swyt delivered his remarks to the Engineering Workforce Commission. He added, "The most important occupation group in the U.S. today, and continuing in your lifetime and your children's lifetime, is that of the technical professionals." *TNX Electronic Engineering Times, Issue 767, October 11, 1993.*

RF Standards Could Impact Hams

New RF safety guidelines proposed by the FCC could have an impact on the Amateur Radio Service. The standards being considered (at press time) are the same as those already adopted by the IEEE and the American National Standards Institute.

Possible ramifications for hams include new questions in the licensing test pool, tougher regulation of RF radiation in new products, and a heightened awareness of possible hazards from exposure to RF. *TNX W5YI Report, Issue 19, October 1, 1993.*

Making Copies

The FCC has published a "Policy on the Private Printing of FCC Forms." Under the Commission's rules, blank forms may be reproduced by private companies at their own expense, provided:

- The form must be comparable in quality to the original document without change to page size, image size, configuration of pages, folds or perforations, and matching as closely as possible the paper weight, paper color, and ink color.
- Reference to the U.S. Government Printing Office must be deleted. Except as above, do not delete from or add to any part of the form, or attach anything to it.
- Do not add any special personalized symbols, words, phrases, or advertising.
- Be sure the current version of the form is being duplicated.

TNX W5YI Report, Issue 19, October 1, 1993.

Hams Fight Arson

Ham operators in Oakland, California, are patrolling the East Bay hills in an effort to stop a recent rash of arson fires. Four volunteer hams are on the lookout team working in cooperation with local fire authorities.

Officials hope the additional presence will help to curb the purposely-set fires. The latest list of arson cases has reminded residents of the fire storm that killed 25 people in the bay area back in 1991. *TNX Oakland Repeater Association, Oakland Tribune, and Westlink Report, No. 658, September 30, 1993.*

Mega-Micro QSO

Paul Lieb KH6HME and Chip Angle N6CA recently set a new 902 MHz terrestrial distance record of 2,469 miles (3,973 km). The CW contact, with signals just out of the noise, came at 0136 UTC on August 23.

For the next four hours, the pair tried unsuccessfully to make contact on 2304 MHz. A frequency near 144 MHz was used for the liason. The equipment used for this historic achievement was designed by N6CA. *TNX Westlink Report, No. 658, September 30, 1993.*

Gert Alert

The Miami-based Sociedad Internacional de Radio Aficionados (SIRA) activated its emergency 20 meter net during hurricane Gert, while 100 mph winds slammed into the Atlantic coast of Central America on September 15. Net control station operator Rafael Estevez WB4ESB handled relief communications with many amateur stations as 65,000 people were evacuated along the Costa Rican and Nicaraguan coastlines. Weather bulletins issued by the National Hurricane Center in Coral Gables, Florida, were also transmitted to Central America, after being translated into Spanish. *TNX W5YI Report, Issue 19, October 1, 1993.*

Rules Change: No Big Deal

So far the concensus is there has been no significant change in amateur radio activity in the wake of the FCC's recent "Relaxing Restrictions on the Scope of Permissible Communications in the Amateur Service." The new Part 97 rules went into effect on September 13, permitting limited business communications on the ham bands.

Under the relaxed rules, hams can now make appointments, give weather report information to the National Weather Service, and order food. Fears that the VHF bands would become a pizza ordering service so far appear half-baked. *TNX W5YI Report, Issue 19, October 1, 1993.*

Shortcut to Maximum Performance

Take the guesswork out of getting maximum antenna performance—use the SWR-121 VHF/UHF or the SWR-121 HF Antenna Analyst. A graphic display shows what's happening with your antenna's SWR vs. frequency. Rugged design and battery operation let you use these Antenna Analyzers anywhere—at a Field Day site, up the tower, or from your shack!

Testing coax has never been quicker or easier! Use your Antenna Analyst to measure the return/loss in dB in a length of coax . . . no more guessing!

Optional software lets you view, save, and print SWR plots on your PC-compatible computer.

For more information on the SWR-121VHF/UHF (120-175MHz, 200-225MHz, 400-475MHz) or the SWR-121 HF (1-32MHz) Antenna Analyst, call AEA's Literature Request Line at (800) 432-8873, or call us direct at (206) 774-5554. Contact your favorite ham radio equipment dealer for best pricing.

AEA

Connect with us

Deluxe Communications Audio Board

Enhance your audio with this practical add-on.

by David Curry WD4PLI

Have you ever wanted to improve the audio quality of your old receiver? Would you like to add technical improvements to a modern receiver? Though state-of-the-art ham transceivers and communication receivers have improved audio design, there are many benefits to building your own auxiliary audio section and implementing it to your receiver. Or, for the truly ambitious, use it as part of your own home-brew communications receiver.

The strategy here is to simply add several audio processes in series to achieve an improved audio output signal. My desire to design something like this was purely selfish. I wanted my long-wave receiver (a Watkins Johnson R-1401) to have some bells and whistles like my Kenwood TS-430S. I'm also in the process of building my own receiver for LF, and I wanted a good audio section to follow the RF section. This audio board will do both nicely.

The first section of the audio stages is an adjustable bandpass filter, providing control of either the frequency or the bandwidth without changing the volume or other parameters. The original bandpass filter circuit appeared in the December 1992 issue of *RF Design*, in an article written by Jefferson Hall and Alvin Connelly. It was an excellent article and I quickly built the circuit, much to my satisfaction. After a short time, however, it was apparent that more circuitry was needed to eliminate a carrier that was within the passband, so I added a simple notch filter. This very effective design was by Randy Seden WD6ELU. The combination of a notch filter and variable bandpass filter can improve receiving conditions, but for weaker signals more circuitry is required.

An additional circuit that adds this improvement, especially for CW, is a regenerative audio stage with adjustable frequency and "Q." This type of circuit has been virtually left behind in modern radio equipment, yet it offers many advantages, considering its simplicity. One of the greatest things about a regenerative or Q-multiplier is the ability it has to reject noise and to peak the desired signal. As the regeneration is increased, the sideband noise drops, which improves your signal-to-noise ratio. The final addition to the audio board is what I call a "digitizer" circuit, which eliminates background noise for CW signals. This is nothing more than a comparator used as a variable threshold detector. The digitizer compares the audio signal to a voltage reference, and provides a square-wave or digital output. The comparator will sometimes trigger on noise that just crosses over the threshold point, so a second comparator is used as a "window," allowing the digitized CW signal (which is stronger) to pass, but not the weaker noise pulse. Low-pass filtering is used to clean up the square-wave signal to a more natural tone. Finally, an audio output circuit that has appeared in virtually every radio handbook was chosen for the speaker section.

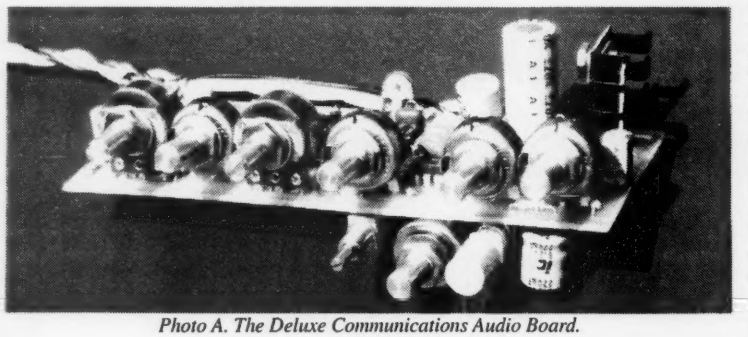


Photo A. The Deluxe Communications Audio Board.

I originally discovered the circuit in a SAMS book written by Walter Jung, *Audio IC Op-Amp Applications*. Low noise and low standby current are the hallmarks of this legendary circuit, using very common components. So let's review: A variable bandpass filter, followed by a variable notch filter, followed by a Q-multiplier, then a digitizer, then a 5 watt audio output section. WOW! With these devices in this particular order, it is very possible to do wonders with your receiver.

Circuit Description

The schematic shows a lot of ICs and parts, but don't let that fool you! The circuit is rather simple and can be followed easily at the top left corner, labeled "Audio Input." C1 is simply a DC blocking capacitor, while R1 sets the overall gain of the first section. If a very low audio signal is connected, R1 can be decreased in value to increase the gain. U1a, b, c, and d are all low-noise quad op amps, which keeps the size down. The filter frequency is adjusted with dual-gang potentiometer R7. The bandwidth is adjusted with R6, which controls the amount of feedback to U1a. The entire top portion of the schematic is the variable audio filter section.

The next stage is the notch filter located directly below U1. U2a and c sections provided a 180-degree phase shift of the frequency controlled by R13a and b. Using two sections of notch filtering provides a very deep null with steep skirts. Summing amplifiers U2b and d provide the nodal point where the phase-shifted frequency meets the original signal and is subtracted to almost zero. U2 is also a low-noise quad op amp. Output of the notch section is applied to R24, which is the regeneration control for the regenerative preamp. The regenerative preamp is located by itself on the right side of the schematic. U3a and b make up a dual low-noise op amp and, as you can see, feedback is applied in desired amounts from the output of U3a to U3b and out to the U3a input again. C10, R27, C9, and R25 and 26 provide the adjustable frequency response for the filter. The potentiometer marked "Q" is adjusted once to allow smooth control of regeneration with R24. If oscillation develops, rotate R28 to the point were oscillation just ceases. The frequency control has a fairly wide frequency range to facilitate most CW signals. The audio signal is sampled at the output of U3a, and directed to switch S1. Normally, S1 is out or OFF, which applies the signal directly

MFJ HF/VHF SWR Analyzer™

. . . Read your antenna SWR from 1.8 to 170 MHz continuously . . . built-in 10 digit LCD frequency counter. . . smooth vernier tuning . . .

MFJ-249 **$199.95**

MFJ-249 handheld *Univeral SWR Analyzer™* lets you read your antenna SWR from 1.8 to 170 MHz quickly and easily without any other equipment!

Has built-in 10 digit LCD frequency counter and smooth vernier tuning.

You get *three* instruments in one . . . high accuracy frequency counter . . . RF signal generator . . . *SWR Analyzer™*

Measure antenna resonant frequencies and 2:1 SWR bandwidths. Adjust mobile antennas, antenna tuners and matching networks in seconds.

Measure feedpoint resistance, inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/ impedance/ loss. Test RF chokes, transformers, baluns.

Use 8 AA cells or 110 VAC with MFJ-1312B, $12.95. 4x2½x6⅛ inches.

MFJ-209, $109.95, same as MFJ-249 less frequency counter.

See *free* MFJ catalog for complete line of MFJ SWR Analyzers™.

MFJ-949E 300 W Tuner

MFJ-949E **$149.95**

World's most popular antenna tuner covers 1.8-30 MHz, has lighted *peak*/average Cross- Needle SWR/ Wattmeter, 4:1 balun for balanced lines and *full size* 300 watt dummy load.

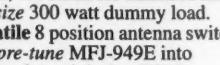
Versatile 8 position antenna switch lets you *pre-tune* MFJ-949E into dummy load to minimize QRM.

Custom inductor switch was carefully engineered to withstand extreme voltages and currents.

Cabinet is chemically etched to MFJ's bond tough *baked-on* paint.

VHF/HF Packet TNCs

MFJ-1270B **$119.95**



MFJ-1270B *super* TAPR TNC clone has a world wide reputation as *the most reliable packet TNC in the world* -- many work 24 hours a day for years without a single failure!

Fully TAPR TNC-2 compatible, VHF *and* HF operation, *free* AC power supply, new *enchanced* mailbox expandable to 512K with auto/reverse mail forwarding, WeFAX mode lets you print weather maps, optional plug-in 2400/9600 baud modems, KISS interface, MFJ Host mode.

MFJ TNC/Mic Switch

MFJ-1272B **$34.95**

MFJ TNC/Mic Switch lets you switch between your TNC or microphone by pushing a button!

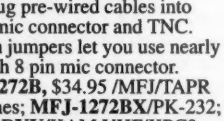
Just plug pre-wired cables into your rig's mic connector and TNC.

Plug-in jumpers let you use nearly any rig with 8 pin mic connector.

MFJ-1272B, $34.95 /MFJ/TAPR TNC2 clones; **MFJ-1272BX**/PK-232; **MFJ-1272BYV**/KAM VHF/KPC3; **MFJ-1272BYH**/KAM HF Port; **MFJ-1272BZ**/PK-88, $39.95 each.

Regenerative RCVR *Kit*

MFJ-8100K **$59.95**



Build this *regenerative* shortwave receiver *kit* and listen to shortwave signals from all over the world with just a 10 foot wire antenna.

Has RF stage, vernier reduction drive, smooth regeneration, five bands.

MFJ-8100W, $79.95, assembled.

MFJ-1278B Multi-Mode Data Controller

MFJ-1278B **$299.95**

Use this MFJ-1278B, your transceiver and computer to transmit and receive digital communications! You'll discover a whole new world of ham radio and communicate in ways you never knew existed on our ham bands.

The *world class* MFJ-1278B Multi-Mode and MultiCom™ software is packed with features *no other* multi-mode gives you.

You get *10 digital modes* . . . Packet, AMTOR, PACTOR (at no extra cost), RTTY, ASCII, Navtex, Color SSTV, 16 Gray Level FAX, CW and Memory Keyer plus an *enchanced* 32K Mailbox.

You'll have fun joining worldwide *packet* networks and exchanging *color SSTV* pictures with your buddies around the world. You'll marvel at *full color FAX* news photos as they come to life on your screen. You'll see weather changes on highy detailed *weather maps* in all 16 gray levels. You'll eavesdrop on late breaking news as it happens on *RTTY*. You'll enjoy error free HF QSOs on *PACTOR* and *AMTOR* and receiving packet mail in an *enchanced 32K mailbox*. Want to copy some *CW*? Just watch your screen.

MFJ-1289, $59.95, MultiCom™ software and cables.

MFJ *halfwave vertical* Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed!

MFJ-1796 **$199.95**

Operate 6 bands -- 40, 20, 15, 10, 6 and 2 Meters --with this MFJ-1796 *ground independent* halfwave vertical antenna! No radials or ground ever needed!

It's only 12 feet high and has a *tiny* 24 inch footprint! You can mount it anywhere from ground level to the top of a tower -- on apartments, condos, small lots, even on motorhomes. Perfect for vacations, field day, DX- pedition, camping.

Frequency selection is fully automatic -- all you do is transmit. Its *low angle of radiation* really reachs out and brings in DX. Omni-directional. 1500 watts PEP.

Efficient *end loading*, no lossy traps. *Entire length* is always radiating. *Full size* halfwave on 2 and 6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands. Add $20 s/h.

Easy to assemble -- you'll have it on the air in an afternoon.

MFJ's *world famous* 3 KW Versa Tuner V

MFJ-989C **$349.95**

Here's why the MFJ-989C is the finest 3 KW antenna tuner money can buy . . .

Two *massive* 250 pf transmitting variable capacitors can handle *amps* of RF current and *6000* RF volts. Logging scales.

Precision ball bearing roller inductor, three digit turns counter and spinner knob give you exact inductance control for minimum SWR.

Lighted *peak*/average Cross-Needle SWR/Wattmeter has 200/2000 watt ranges. Super heavy duty *current* balun has two giant 2½ inch powder iron toroid cores wound with *Teflon®* wire.

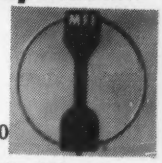
Six position *ceramic* antenna switch has extra large contacts. Flip stand, dummy load, one year *unconditional* guarantee, aluminum cabinet, tough *baked-on* paint, locking compound on nuts/bolts, handles 3 KW PEP, 10¼x4½x15 in. Meter lamp needs 12 volts. Add $13 s/h.

MFJ *No Matter What™* Guarantee

MFJ's famous one year *No Matter What™ unconditional* guarantee means we will repair or replace (at our option) your MFJ product sold in this ad *no matter what* for a full year.

Super Hi-Q Loop Antenna

MFJ-1786 **$249.95**



Tiny 36 inch diameter high efficiency loop antenna covers 10-30 MHz *continuously* with low SWR. Handles 150 watts.

Ideal for home installations where space is limited -- apartments, condos, small lots. Take on trips.

All welded construction.

Remote control has *Automatic Band Selection™*, Cross-Needle SWR/ Wattmeter. No control cable needed. Use batteries or 110 VAC. Add$20 s/h.

No ground or tuner needed.

MFJ-1782, $219.95, like MFJ-1786 but remote control has only slow/fast tune buttons.

Dual Band Mobile Ant.

Mobile Antenna for 144/440 MHz

MFJ-1724B/BB **$14.95**

MFJ *dual band* magnet mount mobile antenna for 144/ 440 MHz has 19 inch stainless steel radiator, low SWR. UHF mobile (MFJ-1724B) or BNC handie talkie (MFJ-1724BB) connector.

5/8 Wave Mobile Ant.

MFJ-1728/B **$24.95**

Maximum Gain™ 5/8 Wave 2 Meter *magnet mount* mobile antenna has stainless steel radiator, 12 ft coax, low SWR. UHF mobile (MFJ-1728) or BNC handie-talkie (MFJ-1728B) connector.

5/8 Wave Ground Plane

$19.95 MFJ-1750 **$19.95**

gets you a 2 Meter 5/8 wave ground plane *home station* antenna! You get the highest gain of any single element antenna, shunt fed matching, ceramic insulators.

MFJ-1752, $19.95, for 220 MHz.

Write or call . . . 800-647-1800

Free MFJ Catalog

Nearest Dealer/Orders: 800-647-1800
Technical Help: 800-647-TECH (8324)
• 1 year *unconditional* guarantee • 30 day money back guarantee (less s/h) on orders from MFJ • Free catalog

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; 8-4:30 CST, Mon-Fri.
FAX: (601)323-6551; Add $6 s/h

MFJ . . . making quality affordable

Prices and specifications subject to change © 1993 MFJ Enterprises, Inc.

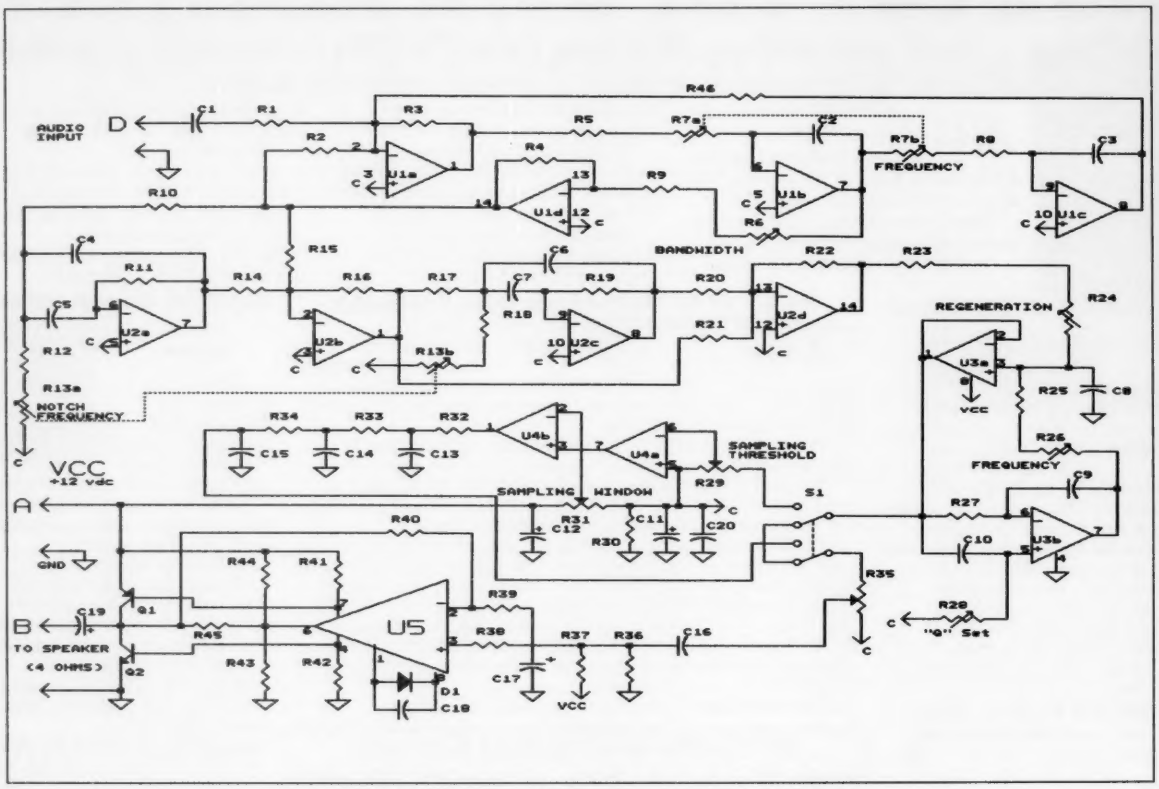


Figure 1. Schematic for the Deluxe Communications Audio Board.

to the audio amplifier stage U5. However, if the digitizer is desired, the signal is routed to comparators U4a and b. The same low-noise dual op amps are used here as with U3. Though not really intended to be used as comparators, the Tl072 or LF353n op amps provide a softer comparator, making the threshold point easier to adjust. Potentiometer R29 is the input threshold control to the first comparator U4a. The signal that triggers the comparator will provide a square-wave output at U4a that is the same frequency as the input signal.

During weak signal conditions some residual noise may slightly trigger the first comparator, creating a small noise spike that is usually lower in amplitude at the output of U4a. To help eliminate this, a second comparator is used, sampling the signal that has the largest square-wave output from U4a by adjustment of R31. R31 is set to not trigger on other noise that has a lower amplitude. U4b provides us a square-wave representation of the signal to the low-pass filter. R23, R33, R34, C13, C14, and C15 comprise a low-pass filter arrangement that attenuates the high frequency components of the square wave, providing a cleaner, more listenable tone. It also lowers the square-wave amplitude to a level that can be used by the audio power amp stage. The audio power amp uses a class AB op amp to drive power transistors Q1, and Q2.

The biasing for these transistors is done within the chip itself. This provides good audio quality at low and high volume levels since the bias is internally etched in U5. Volume is adjusted by R35. Power amp gain is set by R40. Usually there is plenty of gain to drive a common 4 or 8 ohm speaker. Diode D1 is a clamping diode to eliminate any latch-up that might occur if the speaker became shorted. C18 rolls the high frequency off just above 2.5 kHz. Resistors R43, R44, and R45 are used to set the gain and bias for Q1, and Q2. R41 and R42 are part of the biasing and power to U5.

Building Notes

The double-sided circuit board makes building this project very easy. *Remember to solder both sides of this double-sided PC board because the holes are not plated-through.* Note that potentiometers R26 and R29 are located next to switch S1 on the solder side of the board. This helps to fit more controls in a smaller space. R24 *must* be installed before R26. Similarly, R31 *must* be installed before S1, and R30 before R35. A small 5 watt heat sink is sandwiched between Q1 and Q2, and screwed securely.

Many resistors are mounted vertically on the circuit board. A small square on the layout sheet indicates this configuration. A longer rectangle denotes a horizontally-mounted resistor. Be sure to solder all pads on the component side of the circuit board that have connections to any components. The connection points to the speaker, power supply, and audio input are marked on the layout sheet. All points marked "C" on the schematic are connected together as a common bias-point reference. There are no "C" connections to be concerned about during assembly.

Operation

Connect the speaker and the audio input cable to the appropriate points on the circuit board, then apply power. The advised minimum voltage for this circuit is 12 VDC, with up to 18 volts recommended. The higher voltage will help avoid any distortion at high volume. Turn all component-side controls counterclockwise.

Push S1 in to bypass the digitizer section.

Turn the far right hand control clockwise to a comfortable level.

The controls are in this order (from left to right on the component side): Bandpass Filter Frequency, Bandpass Filter Bandwidth, Notch Filter, Q Multiplier, Digitizer Sampling Window, Volume. Under the circuit board are: Q Multiplier Frequency, Digitizer Sampling Threshold, Digitizer Bypass Switch. Take time to experiment with these controls. The Q multiplier and digitizer controls take getting used to. Remember that with a Q multiplier you must have the frequency control at *exactly* the same frequency of the desired signal. The more regeneration you apply to the Q multiplier, the more

SIMPLE, AFFORDABLE & FUN

DESIGNED FOR ONE REASON . . . TO HAVE FUN! AND BOY DOES IT DELIVER!!!

$495

Change bands in a second. Just plug in desired module!

It's SMALL
Makes mobile or portable fun for more hams than ever before. Fits almost any car, even compacts. Measuring only 2.5" X 7.25" X 9.75", this five lb. travel companion tucks in a briefcase with plenty of room to spare.

It's HOT
Receiver runs circles around rigs at twice the price. 90 dB dynamic range, low phase noise design lets you hear the weak ones even on crowded bands. It's no fun if you can't hear em!

It's SIMPLE
Just sit down and operate. Master every feature in minutes - no modern rig is as easy to use. Change band modules in a flash to work 160-10 meters including WARC.

It's AFFORDABLE
At **$495**, it's half the price of the closest competition. No other rig packs so much performance at so low a price. Have fun on HF without spending a fortune.

It's NOT A TOY
Crystal mixing (no synthesizer) coupled with meticulous circuit design yields sparkling clean receive audio. And you'll marvel at the unsolicited compliments on transmit audio.

MADE IN USA

Patented "Jones" Filter provides variable bandwidth 9 pole crystal filter - 500 Hz to 2.5 kHz. The right filter for every condition at the touch of a knob.

"SYNCHRO-LOCK" software keeps VFO virtually drift free regardless of temperature variations.

Optional Noise Blanker

SSB and CW 50 Watts Output Adjustable To 5 Watts

Runs Off 12-14 VDC
TX -10 Amps, RX -.6 Amps

Receive Offset Tuning

Built-in Iambic Keyer with Legendary QSK. Speed adjustable on front and shown in display.

$495* Includes one band module of your choice

$25* Each additional band module

SCOUT ACCESSORIES:

MODEL		PRICE*
296	Mobile Bracket	$15.00
297	Noise Blanker	$19.50
937	11 Amp Power Supply	$79.00
938	Tiny Switching Supply (Only 3 lbs.!)	$95.00
700C	Hand Mike	$39.95
607	Weighted Key Paddle	$39.00
291	Antenna Tuner	$89.00

VISA, MC, DISCOVER

*Plus shipping and handling; call toll-free for charges.

CALL 1-800-833-7373
Telephone Hours:
9:00 AM - 5:30 PM Eastern

...America's Best!
TEN-TEC

1185 Dolly Parton Parkway
Sevierville, TN 37862 USA
Office: (615) 453-7172
Fax: (615) 428-4483
Repair Dept.: (615) 428-0364

KITS ARE BACK!
Introducing TT Kits
A new division of Ten-Tec
Call 615-453-7172
to request your
kit catalog

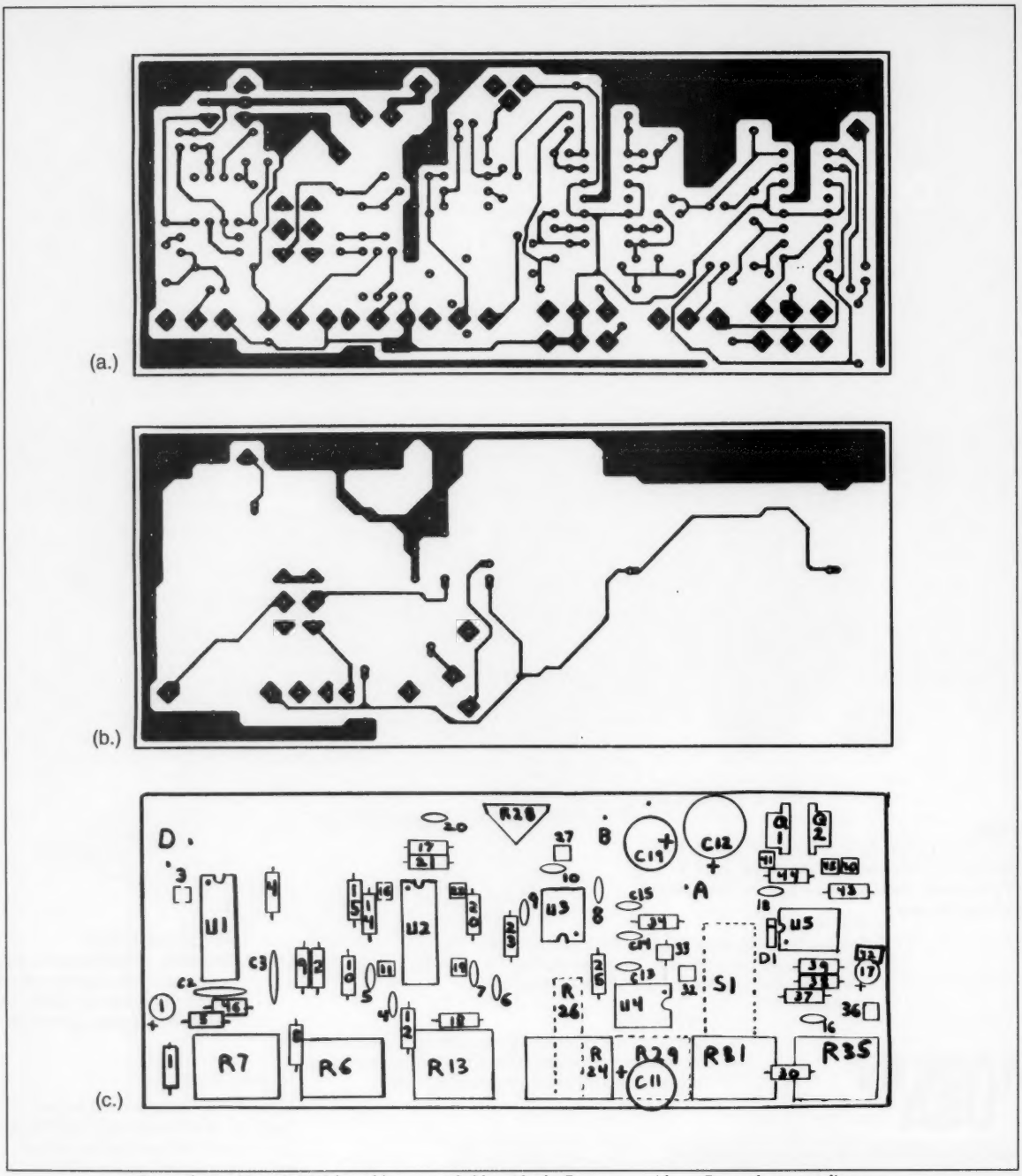


Figure 2. Double-sided PC board layout: a. Solder side; b. Component side; c. Parts placement diagram.

this requirement must be met. Another consequence of using large amounts of regeneration with the Q multiplier is that the CW signal becomes elongated, like a bubble. You can hear this effect distinctly. The digitizer can minimize this effect by triggering on the top portion of the elongated waveform, and then using the window comparator control to shore up the pulse width. Simply put, both controls can adjust the duty cycle when heavy regeneration from the Q multiplier is needed. During regular operation, I recommend notching any undesired signal first, then apply the bandpass filter. Sometimes the Q multiplier works very well to improve SSB or voice communication, but over-driving with too much output volume from the receiver will degrade it's ability to peak the desired signal.

Conclusion

This audio output section will provide improved reception. It is perfect for an easy weekend project, or for someone who wants to "go all the way" and build a complete receiver from scratch. This design matches perfectly to an NE602 mixer or product detector. I would like to thank the authors for engineering these fine circuits, and Randy Seden for his computer design of the notch filter section. 73

See Parts List on page 16.

FROM

Burghardt INC.
AMATEUR CENTER
WORKSHOP

'S NEWS BULLETIN

182 North Maple
P.O. Box 73
Watertown, SD 57201
(south of the North Pole)

Merry Christmas from All the Gang

Stan	WØIT	Darrell	WDØGDF
Tim	WDØFKC	David	KAØJDN
Marty	KBØIOW	Jason	KBØIUS
Jim	WBØMJY	Lorie	Bookkeeping
Sharon	Receptionist	Steve	Shipping

SALES SERVICE SATISFACTION

May your heart and home be Christmas bound.
May your new year be the very best.
Merry Christmas
and
Happy New Years
Burghardt AMATEUR CENTER

TO YOUR HOUSE . . .

. . . from Burghardt's Workshop, straight to your door, we've been busy bringing all the big and little toys for big Girls and Boys. We have connections, not only with Santa Claus, but with the all the big names in Amateur Radio. Not to mention that we are also a fully authorized Icom, Yaesu and Kenwood repair center.

At this time of year, after a long day of work, we like to sit around the fire here in South Dakota and remember all the things we are thankful for.

Thanks ~

Merry Christmas and Happy New Year.

~ for taking the time to read our ad. If we could, we'd like to call each one of you up and wish you a Happy Hamming Year.

~ to all of you who helped keep us in business for over 50 years.

~ to Stan Burghardt, our founder.

~ to our Sales Staff who try to find all the answers to your questions.

~ to our Service Department and their faster than the **"Speed of Reindeer"** Service.

~ to our Bookkeeper and Support Staff who help process your orders.

Sincerely,

James C. Smith

Jim Smith, President

Call or Write For Our Brand New December, 1993 Christmas Shopping Guide

HOURS: MON. - FRI. 8-5 p.m.; SAT. 9-1 p.m.
CLOSED SUNDAYS/HOLIDAYS
Closed Dec. 24-26
Dec. 31-Jan. 2

Burghardt INC.
AMATEUR CENTER

Sales Order Line
1-800-927-HAM 1(4261)

For Technical & Info.
(605) 886-7314

FAX (605) 886-3444

CLIP & SAVE

VISA MasterCard DISCOVER

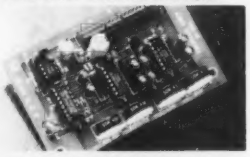
Parts List

Part #	Description	Purchase
C1,C17	4.7 µF electrolytic	Digi-Key
C11,C19	100 µF/16 VDC electrolytic	Mouser: 140-XRL25V100
C12	2200 µF/16 VDC	
C13,C14,C15,C16,C20	0.1 µF/50 VDC disc	
C18	27 pF/50 VDC disc	Digi-Key: P4449
C2,C3	0.01 µF/50 VDC poly.	Digi-Key: P3103
C4,C5,C6,C7,C9,C10	0.0047 µF/50 VDC poly.	Digi-Key: P3472
C8	0.047 µF/50 VDC poly.	Digi-Key: P3473
D1	1N914 diode	
Q1	TIP32B PNP power transistor	
Q1,Q2 H/S	5 watt heat sink	
Q2	TIP31B NPN power transistor	
R1	33k ohm resistor 1/4 watt	
R10,R17	316k ohm resistor 1/4 watt, 1%	Digi-Key: 316KX
R11,R19	634k resistor 1/4 watt, 1%	Digi-Key: 634KX
R12,R18	274 ohm 1/4 watt, metal film, 1%	Digi-Key: 274X
R2,R3,R46,R14,R15,R16,R20,R21,R22	100k ohm resistor 1/4 watt, 1%	Digi-Key: 100KX
R24	50k ohm potentiometer	Mouser: 31CW405
R26	100k ohm 25-turn potentiometer	Mouser: 594-43P104
R28	10k PC mount trim pot.	Mouser: 32RM401
R29,R31,R35	10k ohm potentiometer linear	Mouser: 31CW401
R36,R37,R40	22k ohm resistor 1/4 watt	
R38,R39,R43,R44,R45	1k ohm resistor 1/4 watt	
R4,R30	10k ohm resistor 1/4 watt	
R41,R42	470 ohm resistors 1/4 watt	
R5,R8,R25,R27,R32,R33,R34	6.8k resistors 1/4 watt, 1%	
R6	500k ohm potentiometer, linear taper	Mouser: 31CW505
R7,R13	50k ohm dual potentiometer, audio taper	Calrad: 25-397
R9,R23	4.3k ohm resistor 1/4 watt	
S1	DPDT switch PC mount	Digi-Key: EG1003-ND
S1B	Knob for S1	Digi-Key: EG1092-ND
U1,U2	TL074 low noise quad op amps	
U3,U4	TL072/LF353N op amp	
U5	LM301AN op amp	

A complete kit is available for $76.23 ppd.; a PC board with complete instructions is available for $22 ppd. (CA residents add sales tax) from Curry Communications, 737 North Fairview Street, Burbank, California 91505.

Say you saw it in 73!

UAI-10 AND UAI-20 UNIVERSAL REPEATER/LINK AUDIO INTERFACE



Detailed application manual
Low power operation, 19ma @ 12v
CTCSS decoder on the UAI-20 only
Assembled, tested, one year warranty
Link monitor-mix/monitor mute control
Adjustable repeater/link/DTMF audio outputs
Selectable DTMF mute on repeater and link audio
Repeater, link, auxiliary and control audio inputs

UAI-10 **$44.00** UAI-20 **$89.00**

CREATIVE CONTROL PRODUCTS
3185 Bunting Avenue
Grand Junction, CO 81504
(303) 434-9405

CIRCLE 146 ON READER SERVICE CARD

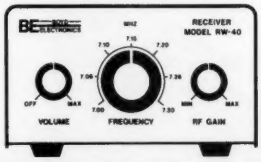
CABLE X-PERTS, INC.

COAX	100 ft./UP	500 FT
FLEXIBLE 9913 DIRECT BURIAL JACKET	.62/ft	.57/ft
9913 EQUAL UV RESISTANT JACKET	.44/ft	.40/ft
RG 213/U MIL-SPEC DIRECT BURIAL JACKET	.34/ft	.32/ft
RG 8/U FOAM 95°s	.30/ft	.28/ft
RG MINI 8X BLK OR CLR UV JACKET	.16/ft	.14/ft
RG 11U FOAM MIL-SPEC.	.42/ft	.40/ft
RG 214/U—MIL-SPEC	1.50/ft	1.30/ft
RG-142/U—MIL-SPEC	1.30/ft	1.10/ft
ROTOR CABLE		
C4080 STD DUTY 2/18-6/22 UV JACKET	.20/ft	.18/ft
C4090 HVY DUTY 2/16-6/20 UV JACKET	.34/ft	.32/ft
18GA 4/C GRAY JACKET	.15/ft	.13/ft
18GA 7/C GRAY JACKET	.18/ft	.16/ft
ANTENNA WIRE		
14GA 168 STR SUPER-FLEX UNINSULATED	.12/ft	.10/ft
14GA 7/22 H.D B.C UNINSULATED	.08/ft	.07/ft
14GA SOLID "COPPERWELD" UNINSULATED	.07/ft	.06/ft
12GA 19 STR FLEXIBLE BC UNINSULATED	.11/ft	.10/ft
BALUNS		**PRICE**
W2AU 1:1 BLN 1.8-40MHz TRNSFRM		$22.50/ea
W2DU 1:1 BLN 1.8-300MHz CRRNT		$25.95/ea
W2AU 1:1-B BLN BMD VER TRNSFRM		$22.50/ea
W2DU-HF-B 10-40 MTR BMD CRRNT		$25.95/ea
40 METER 7.150MHz REYCO COILS		$42.95/pr
40/80 METER ANTENNA KIT		$79.95/ea

MORE ITEMS STOCKED INCLUDING CONNECTORS & ANTENNAS
CABLE & WIRE CUT TO YOUR SPECIFIC LENGTH

ORDERS ONLY: 800-828-3340
TECH INFO: 708-506-1886
113 McHenry Rd., Suite 240
Buffalo Grove, IL 60089-1797

For Complete Literature Mail SASE



DIRECT CONVERSION RECEIVER KITS
For the 20, 30, 40 & 80 Meter Bands
- Single Band CW, SSB, & AM Reception
- Front Panel Decal/Calibrated Dial
- Sensitivity of approx 1 micro-volt
- NE602 Mixer with Varactor Tuning
- Three Pole Input Pre-select Filter
- Six Pole 2KHz Audio/CW Filter
- Oscillator Output for Freq. Counter
- LM380 Audio Amp to drive Speaker
- Uses +12VDC Power Supply

Models RW-20, -30, -40 & -80
Parts & Instruction Kit . . . . . $ 39.95
(cab., knobs & hdwr. not incl.) S/H 4.00

BOYD ELECTRONICS 503-476-9583
1998 Southgate Way VISA/MC
Grants Pass, OR 97527

CIRCLE 273 ON READER SERVICE CARD

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we recognize the need to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed here. These numbers correspond to those on the feedback card opposide this page. On the card, please check the box which honestly represents your opinion of each article or column.

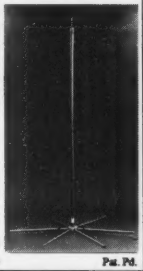
Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

To save on postage, why not fill out the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. All for the low, low price of 29 cents!

1 Never Say Die
2 Letters
3 QRX
4 Deluxe Communications Audio Board
5 Resolving 2 Meter/Cable TV Interference
6 Review: The HANDI-Finder
7 Five-Element T-Match VHF Yagi
8 Remote Tuned Active Antenna
9 Review: Midland 73-005 Transceiver
10 Melt Your Way to Better Breadboards
11 Maxi-Loop 80
12 Hamsats
13 RTTY Loop
14 Carr's Corner
15 Updates
16 Homing In
17 Hams with Class
18 QRP
19 Packet & Computers
20 ATV
21 Above and Beyond
22 Ask Kaboom
23 73 International
25 Dealer Directory
26 Special Events
27 New Products
28 Random Output
29 Propagation
30 Barter 'n' Buy

The FLYTECRAFT™ SFX Line of Monoband Vertical HF Antennas

For those who demand a **high-efficiency antenna** where height and space are critical factors, the FLYTECRAFT™ SFX line is ideal.



• **8 unique models** for 80, 40, 30, 20, 17, 15, 12 & 10 meters. Each only 9 ft. tall (10 meter is slightly shorter.) • **Precision-wound full length helix** gives incredible DX performance. • **Unobtrusive** – Perfect for antenna restricted areas. • **Instant set-up** and tear down, or leave up permanently. • Top whip adjusts for low SWR point. • Uses 2 shortened tuned radials with FLYTECRAFT™ RADIALCOILS™ (10 meter uses 3).

FLYTECRAFT™ SFX Monobanders are in daily use around the world.

Pat. Pd.

Built with pride & sold worldwide ~ FLYTECRAFT™ USA

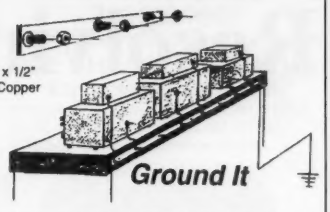
SFX 80 ~ $79.95 40, 30, 20, 17, 15, 12 ~ $69.95 ea.
10 ~ $59.95 Add $6.50 s/h, Cont. U.S.

Satisfaction Guaranteed
VISA/MC PHONE ORDERS
800-456-1273
M-F 9A-5P (PT) 805-583-8173

Send Check/$ Order to: FLYTECRAFT™ P.O. Box 3141 Simi Valley CA 93093

CIRCLE 118 ON READER SERVICE CARD

Is Your Shack Grounded?



Solid Copper Buss Stainless Steel Hardware
Grounding Stud Every 6 Inches
Top or Back Installation

Ground all of your equipment chassis's to a single earth ground in one easy installation. Money back guarantee, if not satisfied!

Add $3 UPS shipping
Mail check/money order to:
J.M.S.
35 Hilltop Ave., Dept. 7
Stamford, CT 06907

2 ft.....$11.95
3 ft.....$16.95
4 ft.....$21.95

Custom Lengths Available

J. Martin Systems

CIRCLE 26 ON READER SERVICE CARD

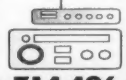
Performance SOFTWARE

KaGOLD for Kantronics w/V5 rom
PkGOLD for AEA PK-88,232,2232

Invest in the GOLD standard today!
Easy operation with incredible power!
• Conferencing • Background File Transfers
• Robot CQs • Logging • Macro Files
• Automatic QTH/QSL Exchange
• Advanced Text Handling
• 95 page Manual
• Extensive Help System
• Quick Reference Guide
• Nothing Else Comes Close
• Only $79.95 plus $5 s/h

InterFlex Systems

Box 6418
Laguna Niguel
CA 92607



VISA
MasterCard
Call or write today for more details!

Phone 714 496-6639

CIRCLE 77 ON READER SERVICE CARD

ICOM® SPECIALIST

SALES AND SERVICE

Technician for 17 years with ICOM can revitalize your old equipment...or trade in for new.

CAP or MARS mod performed on purchases at no extra charge, if requested at time of sale.

SERVICE: $50 per hour
NO MINIMUM * FAST TURNAROUND

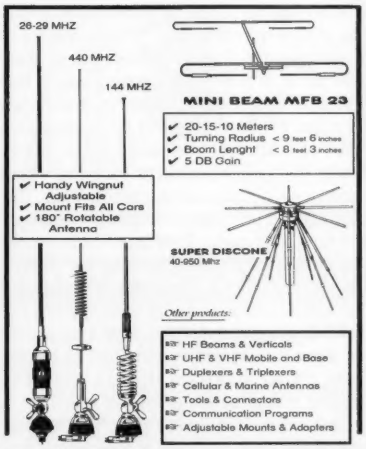
ITECH

Lewisville West Center 701 S. I-35E, Suite 115
Lewisville, TX 75067
(NW corner I-35 & Fox Ave.)
Phone: 214/219-1490 * FAX: 214/219-1687

WA5WZD Fred Palmer
WB5QCY Bea Palmer

(Also service KDK & buy inoperative equipment)

CIRCLE 295 ON READER SERVICE CARD



MAKE CIRCUIT BOARDS THE NEW, EASY WAY

WITH TEC-200 FILM

JUST 3 EASY STEPS:

- Copy circuit pattern on TEC-200 film using any plain paper copier
- Iron film on to copper clad board
- Peel off film and etch

convenient 8½ x 11 size
With Complete Instructions
SATISFACTION GUARANTEED
5 Sheets for $3.95 10 Sheets only $5.95
add $1.50 postage NY Res. add sales tax

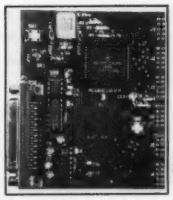
The MEADOWLAKE Corp.
Dept. XE P.O. Box 497
Northport, New York 11768

Microprocessor Based Development Systems

DTMF Decoder $89.95
DTMF-1. Decodes, stores and downloads DTMF to PC. The heart of a complex DTMF controller system.

Fox Hunt TX Controller $69.95
FC-1. Controls 2 IDs, ID interval, delay start time. Programs from PC.

68HC11 Microcontroller $59.95
SBC-2. Develop your own microprocessor project! Programs in assembly completely from PC.



All are low power CMOS, <30 ma, 5 volts DC. Small size, 3.1" X 3.6". Complete documentation included. Add $3.50 for shipping. MD residents add 5% tax. Pre-paid or COD only.

LDG Electronics
1445 Parran Road
St. Leonard MD 20685
410-586-2177

CIRCLE 382 ON READER SERVICE CARD

Resolving 2 Meter/Cable TV Interference

A winning strategy for keeping the peace, and staying on the air!

by S.M. Yost NM8R

Is your 2m packet station in danger because of interference (TVI) it causes to the local cable TV system? Knowing your options, responsibilities, and how to track down the problem can put you back in the driver's seat. This article walks you through the entire process toward resolving this difficult issue: the technical details, how to deal with your neighbors, and how to work successfully with your cable company.

The story starts the same way, and is echoed on packet BBSs across the country: "HELP! My neighbors are up in arms, and mad as heck. I'm interfering with their cable TV. If I don't find a solution soon, my new packet station will have to go QRT. Can anyone help?"

The plea usually goes unanswered, and when it dies off the BBS, with it goes another amateur's hard-earned privilege to enjoy part of his hobby.

Worse, it's not only packet operators who can suffer. Amateur-caused cable television (CATV) interference can rear its ugly head during 2m FM voice operations as well. So, even if you're not packet-equipped (and shame on you if so!), read on . . .

KI8W BBS>NM8R (B,K,L,R,S)
S WB8HSL
MSG# TO FROM DATE TITLE
7258 WB8HSL NM8R 930907 HELP W/2m CATV INTERFERENCE
ENTER MESSAGE/ CTRL-Z TO END

OM—Pulled the message about your CATVI problem from the Bulletin Board tonight. I understand your frustration, but hang in there; this problem can be solved! I had the same difficulty here. I fixed it, though, and I'm still on the air, with happy neighbors to boot. It takes three steps to solve this matter, so let's get started. First, you need a little background.

Long ago it was established that every radio service—commercial, government, and amateur—had its own frequency assignment. These assignments were formed into an orderly structure throughout the radio spectrum. A latecomer, however, called cable TV, added a silent partner to the plan. Silent, because cable TV's coaxial media (versus the ether used by the original tenants) ingenuously allowed room for coexistence. Coax allowed two worlds, the off-air services and CATV, to occupy the same spectrum, separated by only a few mils of copper braid. One is free to roam the ether, while the other exists only within the confines of a coaxial cable. When everything works properly, one never knows the other exists.

Shielding—the basis for this coexistence—is the issue in your case. Because CATV runs a shielded, closed system, it is permitted to borrow frequencies already in use by other services. Nothing leaks *out* to QRM the off-the-air users, and conversely, nothing gets *in* to interfere with the CATV system. This may be great in theory, but how does it stand up in practice?

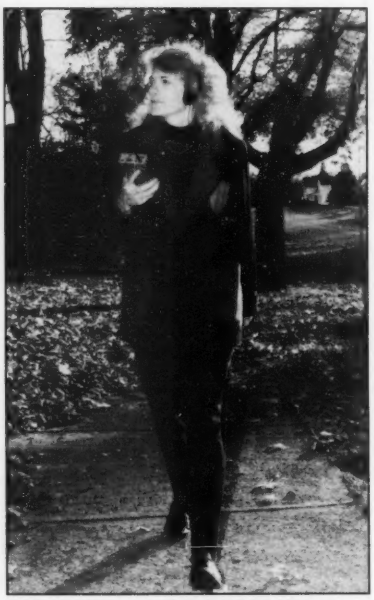


Photo A. Your foot survey for CATV leaks is easy and can be low profile. Who would suspect that this amateur operator (N8HGM) is sniffing out a CATV leak in her neighborhood, rather than just grooving to a tune on her Walkman? Conducting your leak survey while driving is also very effective, but don't forget to pay attention to the road!

Where the Rubber Meets the Road

Unfortunately, there are many things which can degrade a CATV system's shield integrity. When this happens, the door is opened for signals from the outside to get in, and for cable signals to get out. You didn't mention it, but I'll bet the interference is *only* on CATV channel 18, and *only* when you are on 2m. (I'll bet your HF gear, the "traditional" television interference source, isn't guilty at all this time.) Further, I'd wager it's not a harmonic or spurious output from your 2m rig. Consider this: Cable TV assignments are spread throughout the VHF and UHF spectra. They not only share the traditional TV band plan, but also many frequencies *around* it. All told, CATV signals occupy frequencies already in use by aircraft, broadcast TV, public safety services, and VHF amateur radio. Specifically, the video portion of cable channel 18 is centered at 145.25 MHz . . . get the picture?

A cable signal is very weak in relation to the signal you can accidentally inject with your 45 watt, packet-equipped 2m station. Once your signal gets in, it's not even a fair match! Plus, it doesn't take much of a CATV shield breach to let in an ample amount of renegade, 2m energy.

The Open Door

After you've pondered that for a moment, you should be wondering: "If my problem is one of getting into the cable system, why even mention their signal getting out?" The reason is simple: This is where the shared spectrum concept comes to the unexpected relief of amateurs. The shield break that is letting your 2m signal in is spraying wideband video signals over the nearby area. The FCC takes a dim view of cable TV leakage, and for good reason. They don't want jumbo jets thrown off course by escaping "I Love Lucy" reruns! As a result, the FCC requires that cable companies check their systems for leaks, to prevent this. Also, limits are set on the amount of radiation permitted to escape from a CATV system. Lastly, the FCC requires prompt action to resolve leaks.

That covers the theory part. The second step of the three-part plan is foot patrol. Basically, what you'll be doing is scouting your

Continued on page 21

WE SHIP WORLDWIDE

Barry Electronics Corp.

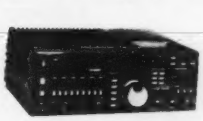
WORLD WIDE AMATEUR RADIO SINCE 1950

Your one source for all Radio Equipment!

For the best buys in town call:
212-925-7000
Los Precios Mas Bajos en Nueva York
WE SHIP WORLDWIDE!
Export orders expedited.
IC-R71A, R72A, R100, R7000A, R7100A, R9000A, IC-725, 728, 729, 735, 737, 765, 781. IC229H, IC3230A, IC901A, GPS Receiver: GP-22

KITTY SAYS: WE ARE OPEN 7 DAYS A WEEK
Saturday 10-5pm/Sunday 11-4 pm
Monday-Friday 9 to 6:00 PM
Come to Barry's for the best buys in town

Wherever I go, I take my radio.
Specialist in RADIOS;
Business marine aviation,
ham radios and scanners.



CONTACT US FOR THE LASTEST IN BUSINESS AND HAM RADIOS, SHORTWAVE RECEIVERS & SCANNERS, MOTOROLA, YAESU, ICOM, KENWOOD, ALINCO, STANDARD,MAXON, RELM, BENDIX KING, SONY, SANGEAN

ICOM

"YAESU Ham and Business Radios"

FT-767GX, FT-890, FT-747GX, FT-990, FRG-8800, FRG-100B FT-736R, FT-1000D, FT-416/816, FT-530, FT-5200, FT-2400, FT-470, FT-530- FT-411E

KENWOOD

ANTENNAS
A-S, AES, Cushcraft, Hy-Gain, Hustler, KLM, METZ, Urban, MODUBLOX, TONNA, Butternut, Multi-Band

"TS-50S", TS450S/AT, R-5000, TS-850S, TM 241/A/441A, TR-751A, Kenwood Service Repair, TS140S, TS690S, RZ-1, TS-790A, TS950SD, TH-78A, TH28/48A, TM-941A, TM-741A, TM-732A, TM-641A, TM-642A.

MARINE RADIOS
ICOM M7, M11, M56, M700TY, M800
AVIATION PORTABLE ICOM A-21
MOTOROLA MARINE KING KX 99

SCANNERS
AOR: 900, 1000, 1500, 2500, 2800, 3000A
ICOM: R-1, R100, R71A, R72A, R7000, R7100, R9000
Bearcat

YAESU ICOM
FT-23R/26/76 IC2/3/4SAT
FT411E-811-911 IC02AT/2SRA
FTH-2008/7008 IC2/4GAT/24AT
IC-A21/U16

Landmobile HT's
ICOM: U16, H16, V100, U400
MAXON, MOTOROLA,
YAESU: FTH 2008/7008
UNIDEN, REGENCY, KING,
MARINE ICOM: M7, M56, M700
AVIATION ICOM: A21 A200 H.T., TAD

ICW2A W2IAT P2AT/4AT

IC-H16/U16 IC2IA

MOTOROLA RADIUS COMMERCIAL RADIOS

TH-78A

FT-530

Budwig ANT. Products
FLUKE 77, 83, 85, 87 Multimeters

Linear Amplifier
Ameritron, Icom, Kenwood, Yaesu

Telephone Autopatch

Patches telephone calls from your radio to phone line. Great for making and receiving phone calls where there are no phone lines. Simple to use. Write or fax for inquires.
Simplex, semi-duplex, full duplex, CES & CSI Models stocked: SDI-50, PPV, CS700/800/900 etc. Our service Lab will wire in systems for you if requested.

Save money on batteries. Ask for Special Prices.

MFJ-989C
8L8H, AT300, etc.

Covercraft Coaxseal Stocked

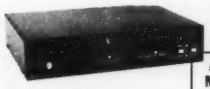
SHORTWAVE RECEIVERS STOCKED

Shortwave Receivers

• SONY • GRUNDIG
• SANGEAN • ICOM

Call 212-925-7000

Satellite telephone in suitcase for worldwide use. WRITE.



Computer Interfaces Stocked: MFJ-1270B, MFJ-1274, MFJ-1224, AEA PK-88, MFJ-1278T, PK-900, PK-232 MBX W/FAX, DRSI PRODUCTS DSP 2232

Antenna Tuners:
MFJ, AEA AT-300, ICOM, KENWOOD, YAESU.

COMMERCIAL & HAM REPEATERS STOCKED. WRITE FOR QUOTES

Kantronics
KAM PLUS, KPC 2/3/4, KPC2400, SUPER FAX II, KPC IV, Data Engine, D4-10, etc.

MOTOROLA AUTHORIZED DEALER
KACHINA COMMUNICATIONS DEALER

AUTHORIZED DEALER
SONY.
Shortwave Radios Stocked
DIGITAL FREQUENCY COUNTERS
OPTOELECTRONICS model 1300 H/A, 0-1300MHz 2300, 2210 H, 0-2200 MHz, 2600H, UTC-3000, 2810

AMPLIFIERS STOCKED:
RF Concepts
Mirage
TE Systems

Radios for Business, Gov't, 2-way, etc. Stocked & Serviced,
Call for Great Prices!

ALINCO DJ580T, 120T, 162T, 460T, 180T, F1TH, DR570T, etc.

Wide selection of SW & Amateur Publications

Telephone scramblers for cellular and regular phones. $299.00 each

CAR Stereo with Shortwave
Phillips DC-777 @ $499.95 in stock

BIRD Wattmeters & Elements In Stock

COMET ANTENNAS STOCKED

HEIL EQUIPMENT IN STOCK

ANTENNAS: AEA, AlphaDelta, ANLI, Antenna Specialist, Barker & Williamson, Comet, Cushcraft, Diamond, GAP, Hy-Gain, Hustler, Larsen, Etc.

EIMAC
3-500Z
572B, 6JS6C
12BY7A &
6146B

(144, 220, 440 MHz), Isoloop.

BIRD Wattmeters & Elements In Stock

Long-range Wireless Telephone for export in stock

BENCHER PADDLES
BALUNS LOW PASS FILTERS
IN STOCK

MIRAGE/RFC Amplifiers
ASTRON POWER SUPPLIES
Belden Wire & Cable, Int'l Wire
OPTO KEYERS STOCKED

STANDARD.

JRC Short-wave radios
JST135, NRD-535D

Hy-Gain Towers will be shipped direct to you FREE of shipping cost.

Ameritron Amplifiers
AMERITRON

MAIL ALL ORDERS TO: BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012 (FOUR BLOCKS NORTH OF CANAL ST., BETWEEN SPRING AND BROOME ST.)

New York City's LARGEST STOCKING HAM DEALER
COMPLETE REPAIR LAB ON PREMISES

"Aqui Se Habla Espanol"
BARRY INTERNATIONAL
FAX 212-925-7001 Phone 212-925-7000
Monday-Friday 9 A.M to 6:00 P.M.
Saturday 10- 5pm /Sunday 11- 2pm

IRT/LEX-"Spring St. Station". **Subways:** BMT-"Prince St. Station". IND-"F" Train-Bwy Station"
Bus: Broadway #6 to Spring St. Path-9th St./6th Ave. Station.

COMMERCIAL RADIOS STOCKED: ICOM, Motorola, MAXON, Standard, Yaesu. We serve municipalities, businesses, Civil Defense, etc. Portables, mobiles, bases, repeaters...

We stock: AEA, Alinco, Ameco, Ameritron, Antenna Specialist, ARRL, Astatic, Astron, B&K, Belden, Bencher, Bird, Butternut, CES, Cushcraft, Daiwa, Elmac, Henry, Heil, Hustler, Hy-Gain, Icom, KLM, Kantronics, Kenwood, Larsen, Maxon, MFJ, Mirage, Motorola, Nye, Palomar, RF Products, Shure, Standard, TUBES, Uniden, Yaesu, Vibroflex, Duplexers, Repeaters, Scanners, Radio Publications

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
HAM DEALER INQUIRES INVITED PHONE IN YOUR ORDER & BE REIMBURSED
COMMERCIAL RADIOS stocked & serviced on premises.
Amateur Radio Courses Given On Our Premises, Call
Export Orders Shipped Immediately.

ALL SALES FINAL

Technical help offered upon purchase

FAX: 212-925-7001

CIRCLE 41 ON READER SERVICE CARD

FOXHUNT HEADQUARTERS

Locate hidden or unknown transmitters fast. The Foxhound direction finder connects to the antenna and speaker jack on any radio receiver, AM or FM from 1 MHz to 1 GHz. The antenna (a pair of dipole telescopic whips) is rotated until the Null meter shows a minimum. A pair of LEDs indicate to turn Left or Right. The Foxhound is ideal to use with a walkie-talkie, if you wish to transmit, go ahead, a built-in T/R switch senses any transmitted RF and switches itself out of circuit while you talk. It doesn't get any easier than this! We provide all parts except for a few feet of 1/2 inch PVC pipe avialable at any hardwar e store for a dollar or two. Add our matching case set for a complete finished unit. Be the one with the answers, win those transmitter hunts and track down those jammers, you'll do it all with your Foxhound.

Add some fun to your club events by having a transmitter hunt! Foxhunting is a craze sweeping the nation, but many clubs are missing out on the action because they lack the expertise or time to develop their own foxhunt transmitter. We set one of our most devious and sneaky engineers to the task of designing an easy to build and use, yet highly capable Foxhunt transmitter. A snazzy microprocessor controller has both preset and programmable transmission characteristics allowing you to easily set the difficulty level from "beginner" to "know-it-all"! The SlyFox, FHT-1, is crystal controlled in the 2 meter band (crystal for 146.52 included) with a power output of 5 watts that is adjustable by the controller.The transmitter is programmed to ID in CW or add our voice option if you really want to aggravate the troops - "Ha ha, you can't find me!" Join the fun, get rid of those stuffy old meetings and picnics, have a foxhunt!

DF-1 Foxhound direction finder kit.....**$59.95** CDF Matching case set for DF-1 ....**$12.95**
FHT-1 SlyFox Foxhunt transmitter kit..**$129.95** FHID-1 Voice ID option.....**$29.95**
CFHT Heavy duty metal matching case set for FH T-1 .....**$29.95**

TOUCH-TONE DECODER

Grab Touch-Tone numbers right off the air, phone or tape. A simple hook-up to any radio speaker or phone line is all that is required to instantly decipher touch-tone phone numbers or codes. A 256 digit memory stores decoded numbers and keeps its memory even in the event of power loss. An 8 digit LED display allows you to scroll through the memory bank to examine numbers. To make it easy to pick out number groups or codes, a "dash" is inserted between sets of digits that were decoded more than 2 seconds apart. A "central-office" quality crystal controlled decoder is used allowing rapid and reliable detection of numbers at up to 20 digits per second! For a professionally finished look, add our matching case set. Start cracking those secret codes tomorrow with the Tone Grabber!

TG-1 Tone Grabber kit.....**$99.95** CTG Matching case set.....**$12.95**
TG-1WT Fully assembled TG-1 and case **$149.95**

TOUCH-TONE REMOTE CONTROL

Control virtually anything by Touch-Tone remote control. The URC-1 has 16 switched outputs, 4 adjustable voltage outputs (20 mV steps 0 to 5 VDC), two 10K digital pots (for volume, squelch, etc.) and 3 timers adjustable from 10 mS to 40 hours! Two level password control allows secure control and multi-level access. Six digit LED display shows currently entered codes and a crystal controlled touch-tone decoder provides reliable operation. There's nothing else like this unit, be in complete control of remote radios, thermostats, hi-fi's, homes or even factories with the URC-1. Add our matching case set for a handsome finish.

URC-1 Remote control kit .....**$129.95** CURC Matching case set.....**$12.95**
URC-1WT Fully assembled URC-1 and case **$189.95**

DIGITAL VOICE RECORDER

Chatterbox digital voice storage unit will record your message of up to 20 seconds. Time is split up into four 5 second blocks which can be played separately or cascaded for longer messages. An LED display shows message location and current mode for easy operation. Nifty built-in interfaces allow simple connection to transmitters for automatic keying when the PTT is initially closed or after it is released. You can even loop your rig's mike through the Chatterbox. For contest or fun use, the CB-1 can drive an external speaker. Includes a built-in electret mike. For that finishing touch, add our matching case set.

CB-1 Voice recorder kit .....**$59.95** CCB Matching case set **$12.95**

FM SUBCARRIER DECODER

Tap into the world of commercial-free music and data that is carried over many standard FM broadcast radio stations. Decoder hooks to the demodulator of FM radio and tunes the 50-100 KHz SCA subcarrier band. Many radios have a demod output, but if your radio doesn't, it's easy to locate, or use our FR-1 FM receiver kit which is a complete FM radio with a demod jack built-in. These "hidden" subcarriers carry lots of neat programming - from stock quotes to news to music, from rock to easy listening - all commercial free. Hear what you've been missing with the SCA-1.

SCA-1 Decoder kit.....**$24.95** CSCA Matching case set.....**$12.95**
FR-1 FM receiver kit .....**$19.95** CRR Matching case for FR-1.....**$12.95**

SCANNER CONVERTER

Tune in on the 800-950 MHz action using your existing scanner. Frequencies are converted with crystal referenced stability to the 400-550 MHz range. Instructions are even included on building high performance 900 MHz antennas. Well designed circuit features extensive filtering and convenient on-off/bypass switch. Easy one hour assembly or available fully assembled. Add our matching case set for a professional look.

SCN-1 Scanner converter kit .....**$49.95** SCN Matching case set.....**$12.95**
SCN-1WT Assembled SCN-1 and case.....**$89.95**

STEREO PEAK HOLD BARGRAPH

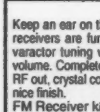
Finally a dual LED bar graph with a peak hold display! Bar graph displays are neat and eye catching but their speed is their downfall - they just can't capture the peaks. Our kit is like two units in one, a fast display to show the signal and a long persistance display to capture peaks, similar units go for hundreds of bucks! We offer 3 models: Linear for general use, Semi-Log for audio VU meters, and Log for power displays. Dual - for stereo! - 10 segment multi-colored LED display for snazzy, eye grabbing display and easily set ranges for virtually any signals, from voltmeters to audio VU meters to audio power amps to SWR meters. Complete intructions for easy hook-up to most any device. Add our matching case set for a sharp looking unit.

PH-14 Dual Linear bargraph kit.....**$39.95** PH-15 Dual Log bargraph kit.....**$39.95**
PH-16 Dual Semi-Log bargraph kit.....**$39.95** CPH Matching case set **$12.95**

SURROUND-SOUND/REVERB

Add concert hall realism to your stereo, TV or even 2-way radio! Easily sythesize a stereo effect from mono sources or richly enliven regular music. Add a big-voice reverb to your radio voice that others will envy! Our reverb/surround sound kit uses a Bucket Brigade IC Device for reliable solid-state performance. Adjustable reverb, delay and mix controls to customize your sound. Easily connected to radios, stereos, CB's and TV's. Plently of audio to drive a small speaker for stand-alone operation too. Experience the fun and realism that surround sound provides - without spending hundreds! Add our case set for a neat, pro look.

RV-1 Surround Sound/Reverb kit.....**$59.95** CRV Matching case set.....**$12.95**
RV-1WT Assembled RV- 1 and case **$99.95**



SPEED RADAR

New low-cost microwave. Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual Doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

SG-7 Complete kit.....**$89.95**

FM RECEIVERS & TRANSMITTER

Keep an ear on the local repeater, police, weather or just tune around. These sensitive superhet receivers are fun to build and use. Tunes any 5 MHz portion of the band and have smooth varactor tuning with AFC, dual conversion ceramic filtering, squelch and plenty of speaker volume. Complete manual details how the rigs work and applications. 2M FM transmitter has 5W RF out, crystal control (146.52 included), pro-specs and data/mike inputs. Add our case sets for a nice finish.

FM Receiver kit Specify band: FR-146 (2M), FR-6 (6M), FR-10 (10M), FR-220 (220MHz).....**$29.95**
CFR Matching case set .....**$12.95** FT-146 Two Meter FM transmitter kit.....**$79.95**

20 METER SSB/CW TRANSCEIVER
DDS • DUAL VFO • BUILT-IN KEYER

Imagine taking this cute little 20 Meter SSB/CW rig on business trips or vacations, there's feature galore with this beauty ! A DDS (Direct Digital Synthesis) synthesizer tunes in 10 Hz steps, two VFO with memory and digital RIT with freq display! Convenient features like a dial fast button allows you to hop around the band and dual selectable AGC allows comfortable operating. Instant, one-touch WWV reception for quick band condition checks and microprocessor control with built-in lambic CW keyer that has digital readout of speed! Perky 10 watt RF output (only 1 1/2 S units below 100 watts) can be tumed down for QRP. Includes hand mike with handy Up/Down buttons for easy remote tuning. This rig's a joy to operate, with performance equal to units costing hundreds of dollars more and with some features not found on any rig at any price! Covers the 20 M band 14 -14.5 MHz plus 15 MHz WWV. Our easy to follow instructions have you assemble the kit in simple "bite-sized" sections that are tested as you build, assuring you of a rig that works first time. Experience the pleasure of saying the rig here is home-brew! Available in kit or fully wired.

SX-20 SSB/CW transceiver kit .....**$349.95** SX-20WT Fully assembled SX-20 .....**$429.95**

FANTASTIC FM TRANSCEIVERS SYNTHESIZED—NO CRYSTALS

Ramsey breaks the price barrier on FM rigs! The FX is ideal for shack, portable or mobile. The wide frequency coverage and programmable repeater splits makes the FX the perfect rig for Amateur, CAP or MARS applications. Packeteers really appreciate the dedicated packet port, "TRUE-FM" signal and almost instant T/R switching. High speed packet? ...No problem. Twelve diode programmed channels, 5W RF output, sensitive dual conversion receiver and proven EASY assembly. Why pay more for a used foreign rig when you can have one AMERICAN MADE (by you) for less. Comes complete less case and speaker mike. Order our matching case and knob set for that pro look.

FX-50 kit (6 Meters).....**$149.95** FX-146 kit (2 Meters) **$149.95**
FX-223 kit (1 1/4 Meters)....**$149.95** FX-440 kit (3/4 Meters) **$169.96**
CFX matching case set.....**$24.95** FXM-1, ICOM/Yaesu style speaker mike ..**$24.95**

2 MTR & 220 BOOSTER AMP

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz units. Both have all the features of the high-priced boosters at a fraction of the cost.

PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested **$89.95**
PA-20 220 MHz POWER BOOSTER (8 X power gain)
Fully wired & tested **$89.95**

STEREO FM TRANSMITTER

Run your own Stereo FM radio station! Transmits a stable signal in the 88-108 MHz FM broadcast band up to 1 mile. Detailed manual provides helpful info on FCC regs, antenna ideas and range to expect. Latest design features adjustable line level inputs, pre-emphasis and crystal controlled subcarrier. Connects to any CD or tape player, mike mixer or radio. Includes free tuning tool too! For a pro look add our matching case set with on-board whip antenna

FM-10A Stereo transmitter kit **$34.95** CFM Case,whip ant set..**$12.95**

FM WIRELESS MIKES

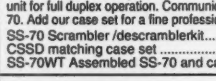
Pick the unit that's right for you. All units transmit a stable signal in the 88-108 MHz FM band up to 300' except for High power FM-4 and PB-1 Phone bug that go up to 1/2 mile.

FM-1 Basic unit **$5.95**
FM-2, as above but with added mike pre amp.....**$7.95**
FM-4, long range with very sensitive audio pickup ..**$14.95**
PB-1, Phone bug needs no battery, hooks t o phone line.**$14.95**
MC-1, Micro size sensitive mike cartridge
for FM-1,2,4 .....**$2.95**

SPEECH SCRAMBLER

Descramble most scramble systems heard on your scanner radio or set up your own scambled communication system over the phone or radio. Latest 3rd generation IC is used for fantastic audio quality - equivalent to over 30 op-amps and mixers! Crystal controlled for crystal clear sound with a built-in 2 watt audio amp for direct radio hook-up. For scramble systems, each user has a unit for full duplex operation. Communicate in privacy with the SS-70. Add our case set for a fine professional finish.

SS-70 Scrambler /descramblerkit.....**$29.95**
CSSD matching case set **$12.95**
SS-70WT Assembled SS-70 and case set.....**$69.95**



AIRCRAFT RECEIVER

Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110-136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.

AR-1 kit **$24.95**
Matching case set, CAR **$12.95**

AM TRANSMITTER

High quality, true AM broadcast band transmitter is designed exactly like the big commercial rigs. Power of 100 mW, legal range of up to 1/4 mile. Accepts line level inputs from tape and CD players and mike mixers, tunable 550-1750 KHz. Complete manual explains circuitry, help with FCC regs and even antenna ideas. Be your own Rush Limbaugh or Rick Dees with the AM-1! Add our case set for a true station look.

AM-1 Transmitter kit **$24.95**
CAM Matching case set.....**$12.95**

MICRO-MIKE

World's smallest FM wireless mike. Smaller than a sugur cube - including battery and mike. Two sets of SMT parts supplied in case you are clumsy! Terrific audio pick-up (pin drop at 5 ft) and transmit range of 300 ft. We include the battery (watch style), electret mike and even a tuning tool! Be a James Bond and learn SMT too!

FM-5 Micro mike kit **$19.95**

CRYSTAL RADIO

Relive the radio past with a crystal set like your grandfather built. Uses genuine Galena crystal and catwhisker. Several different types of radios are built, including standard AM broadcast, shortwave and even WW II foxhole style. To compare modern semiconductor detectors, we include a diode for comparison. No soldering required and we even give antenna ideas. Radio for free, get it now before Clinton taxes it!

CS-1 Crystal set kit **$19.95**

SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4-11 MHz. True superhet, has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project, provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3-22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!

Shortwave receiver kit, SR1 .....**$29.95**
Shortwave converter kit, SC1 .....**$27.95**
Matching case set for SR1, CSR.....**$12.95**
Matching case set for SCI, CSC **$12.95**

QRP TRANSMITTERS RECEIVERS LINEAR AMPLIFIERS

20, 30, 40, 80M CW TRANSMITTERS

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.

Your choice of bands(Specify band: QRP-20, 30, 40, or 80) **$29.95**
Matching case
knob set.CQRP **$12.95**

20, 30, 40, 80M All Mode RECEIVERS

Build your own mini ham station Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602, IC as featured in *QST* and ARRL handbooks. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational—ideal for beginner or old pro. New 30-page manual. Add the case set for well-fitted professional look.

(Specify band: HR-20, HR-30, HR-40, HR-80) **$29.95**
CHR, Matching case **$12.95**

QAMP

For a slick little QRP boost, use one of the 20 Watt amplifiers. Needs only 1/2-2 watts of drive for full output, linear for SSB, AM or CW operation, power MOSFETs for high effiecency and multistage low pass filter for a clean signal. Built-in T/R relay for automatic switching, runs on 12-15 VDC at 2-4 amps. Add our matching case set for a complete station look.

Your choice of bands.....**$49.95**
Specify band: (QAMP-20, 30, 40, 80)
CQAMP Matching case set **$12.95**

ORDERS CALL 1-800-4 HOBBY KITS (446-2295)
TECH/ORDER/INFO (716)924-4560 FAX (716)924-4555

TERMS: Satisfaction guaranteed. Examine for 10 days. If not pleased return in original form for refund. Add $3.95 for shipping, handling and insurance. For foreign orders add 20%- for surface mail. COD (U.S. only) add $5.00. Orders under $20 add $3.00 NY residents add 7%- sales tax. 90-day parts warranty on kit parts, 1 year parts & labor warranty on wired units.

RAMSEY ELECTRONICS, INC 793 CANNING PARKWAY VICTOR NY 14564

CIRCLE 34 ON READER SEVICE CARD

2WAY RADIO SERVICE MONITOR

COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantastic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features • Direct entry keyboard with programmable memory • Audio & transmitter frequency counter • LED bar graph frequency/error deviation display • 0.1-10.000 µV output levels • High receive sensitivity, less than 5 µV • 100 kHz to 999.9995 MHz • Continuous frequency coverage • Transmit protection, up to 100 watts • CTS tone encoder • 1 KHz and external modulation.

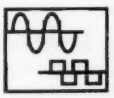
COM-3 2 Way Radio Service Monitor.....**$2995.00**

SYNTHESIZED SIGNAL GENERATOR

Finally, a low-cost lab quality signal generator—a true alternative to the $7,000 generators. The RSG-10 is a hard working, but easy to use generator ideal for the lab as well as for production test. Lease it for less than $3.00 a day. Features • 100 KHz to 999 MHz • 100 Hz resolution to 500 MHz, 200 Hz above • –130 to 10dBm output range • 0.1 dB output resolution • AM and FM modulation • 20 programmable memories • Output selection in volts, dB, dBm with instant conversion between units • RF output reverse power protected • LED display of all parameters—no analog guesswork!

RSG-10 Synthesized Signal Generator.....**$2495.00**

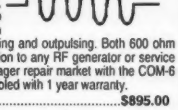
SYNTHESIZED AUDIO GENERATOR



DDS (Direct Digital Synthesis) technology brings you a terrific audio generator at a fantastic price! Generates from 0. 01 Hz to 50 KHz with five digit LED display of frequency. Sine and square wave output adjustable 0-1 volt p-p. Frequency selected by direct keyboard entry and with handy continuous tune tuning knob. Crystal controlled accuracy of 10 ppm and two memories for rapid frequency changes. Retire that jury-rigged old generator and treat yourself to the pleasure of using a new state-of-the-art SG-550!

SG-550 Kit.....**$169.95** ...SG-550WT assembled.....**$229.95**

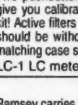
DIGITAL CODE SYNTHESIZER



Generate all popular signaling codes used in paging, and two-way radio. Generate DTMF, MF, MTS, IMTS, Single, Dual, 5/6 tone, tone remote, DPL, POCSAG, GOLAY and NEC. Two audio synthesizers with 0.1 Hz resolution and programmable duration, spacing and outpulsing. Both 600 ohm and TTL outputs for easy connection to any RF generator or service monitor. Get in on the profitable pager repair market with the COM-6 universal synthesizer. Fully assembled with 1 year warranty.

COM-6 Code Synthesizer.....**$895.00**

MOTOR CONTROLLER



Control the speed and direction of any motor. Use our SMD-1 for those nice steppers you see surplus, and our MSC-1 for DC motors. The stepper driver features variable speed, half step rotation, direction and power down mode, can drive most any stepper motor. Our DC driver features pulse width modulation control allowing full motor torque even at low speeds and can drive motors up to 50 VDC @ 10 Amps! Add our case set for a professional assembly.

SMD-1 Stepper kit.....**$24.95** MSC-1 DC mot or kit...**$24.95**
CSMD SMD-1 case.....**$12.95** CMSC MSC-1 case.....**$12.95**

L-C METER

Measure inductors from 10 uH-10mH and capacitors from 2 pF-2uF with high accuracy by connecting the LC-1 to any digital multimeter. Two pushbutton ranges for high resolution readings and we even give you calibration components to assure proper accuracy of your kit! Active filters and switching supplies require critical values, no one should be without an accurate LC meter. For a pro look, add our matching case set.

LC-1 LC meter kit .....**$34.95** CLC case set.....**$12.95**

MINI KITS

Ramsey carries a complete line of low cost, easy to build, easy to use functional kits that can be used alone or as building blocks in larger more complex designs. Mini-kits include audio amps, tone decoders, VOX switches, timers, audio alarms, noise-makers and even shocking kits! Call for our free catalogue!

PACKET RADIO

Two new versions are available for the Commodore 64 (P-64A) or the IBM-PC (P-IBM). Easy assembly NO TUNING". Includes FREE disk software, PC Board and Full Documentation. Kit form.

P-64A .....**$59.95** P-IBM .....**$59.95** CASE CPK.....**$12.95**

ACTIVE ANTENNA

Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!

AA-7Kit .....**$24.95** Matching case & knobset, CAA.**$12.95**

CW KEYER

Send perfect CW. Microprocessor keyer features 4 programmable memories of up to 26 words each, lambic keying, dot-dash memory, variable speed from 3-60 WPM, adjustable sidetone, keying to any rig and fully RFI proof. EAROM memory keeps messages up to 100 years - you'll go silent before the key! Includes built-in touch paddles or use your own. Easy assembly and matching case set available for a nice station look.

CW-700 Micro keyer kit.**$69.95** CMK Matching case set....**$12.95**
CW-700WT Assembled CW-700and case.....**$99.95**

CIRCLE 34 ON READER SEVICE CARD

Resolving 2 meter/Cable TV Interference

Continued from page 18

neighborhood with a portable FM radio, so put on your sneakers!

Recon!

Though it's the cable company's job, you can track down the leak source (they call it an "egress") yourself. But why would you *want* to? Don't get the wrong idea—you won't fix any leak you find. That's up to the CATV company. You'll see in a moment, though, why it's helpful to know the source of the shield breach causing the leak. For now, be satisfied that it may save you some embarrassment if the source is in your own home! Before starting, however, carefully heed the following warning: *Do not trespass on other people's property* while performing your self-styled leak survey. It's not worth a load of No.7 shot, or a tangle with a Doberman, to find the leak! Ham radio needs your picture in the local paper because you hooked up a homesick foreign exchange student with her family or ran a battery of phone patches for weary servicemen through MARS, *not* because of an article about your arrest for trespassing! 'Nuff said?

For our purposes, you can perform a leak survey handily from the sidewalk, or from your car. Don't do it from other people's yards without their permission (and even with their permission, only with great care).

So . . . how do you do it?

Sniffing It Out

CATV systems inject a special modulated RF carrier into their system to act as an "odorant," sort of like the gas company does. If they have a shield break—an egress—this tone-modulated radio frequency carrier, or tracer, intentionally escapes the cable and they sniff it out with equipment carried in their vans. Luckily, you can use a portable FM broadcast band (BCB) radio to do the same! Just like your nose finds a gas leak because of the odorant injected, your portable FM radio can find a cable TV leak.

Here's how to put your amateur version of the sniffer to work. First, determine what frequency the tracer is on in your area. Do this by placing an FM BCB portable radio near your own cable TV coax. (What? No CATV in your home? Then try this test with a cooperative neighbor, or even better, the one who is complaining.) Disconnect the incoming CATV coax from the TV or VCR and, with an FM radio close by, tune until you come across a raucous whoop-whoop-whoop tone. If the carrier injector is turned on, you *can't* miss it. In my area this carrier resides around 107.8 MHz, although in some locales it's placed in the middle of the FM band. Once you know the tracer carrier's frequency, drive or walk your neighborhood, listening for this obnoxious tone. (Hook the coax you pulled for this test back up, first!)

Don't be surprised if you encounter a number of cable TV leaks in your search. Not everything you will hear, however, is a leak the cable company needs to be concerned about. There *is* a permissible amount of radiation, tolerated by the FCC. You'll quickly learn to sort out the weak ones from the strong ones.

Note, too, that the sensitivity of a car's FM BCB radio is greater than the squelch setting of the commercial sniffers the CATV companies use. As a guideline, you're interested in strong leaks within a few block area of your QTH. A strong leak would be one where you hear "S9" more than 50 feet from its source. I find the car radio works best for the general search, and a portable radio for pinpointing the source.

Just remember this clue, Sherlock: Where their signal escapes, your signal enters.

What to Look For

Once your sniffer has helped you zero in on a possible leak, you need to turn to your observation skills. As you drive the system, pay particular attention to pedestal junction block housings (those 12" square by 3'-high metal boxes), and any pole-mounted distribution amplifiers. Also, scan the overhead cables for any that may have been damaged by falling branches. At a residence, the leak source can be damaged or water-corroded cable, especially in the drip loop where it enters a house. Also look for loose connectors or unterminated splitters or cable runs. Devices a subscriber puts on his line, such as cheap (poorly-shielded) coax, lengths of 300 ohm twinlead(!), and game switches, can breach the system's integrity, too. One other possibility to be aware of is the illegal tap. Take the safe path and let the cable employees "discover" these.

Why go through the hassle of hunting down the leak yourself? You don't need to. But it will help, and might even favorably impress the CATV company if you can tell them where you think the egress is located. Possibly you can even guide the CATV tech, saving him time in his search.

Contacting the Cable Company

The last step toward a solution is to make contact. (This should be easy; you're a ham, remember?!) Once you're at this point, simply pick up the telephone and call the cable company.

First, some tips to make your effort more successful:

Plan what you will say *before* calling. Your goal is to get one point across, clearly: You're the one who is causing the interference (*that* will get their attention), and you want to resolve the matter quickly, to their benefit as well as yours. Speak and act professionally—it will make a more favorable impression. Ask to speak with the System Manager, his assistant, or a member of the Engineering Department. (You may prefer to visit the cable company's office and deliver your message personally. If you're the charming, amiable type, the doors will open quickly.) After you've clearly stated your reason for contacting them, run down the following list of points to discuss: Explain

the problem and how you know the things you do. (Expect them to be curious how you know about the technical aspects of their system.) Use the word egress. (They prefer it to leak; it sounds less threatening.) Did you find anything in your own search for the egress? If so, tell them now.

Have they encountered this problem before? How did they resolve it?

Keep in mind it's not always a fault of their system that causes the leak—oops, egress. It can be devices the subscriber puts on the line. They should be as interested in these, however, as defects in their own system. Either can allow CATV signals to escape, or permit outside signal entry. It's all in how you present it.

Don't pepper your speech with ham "Q" signals. Even though we talk this way, CATV people won't find it intelligible, or amusing.

Inquire if the cable company noted any leaks in your area at their last FCC-mandated leak survey. (They refer to this survey as

CATV Notes

CATV Frequency Assignments

Knowing what frequency is used (and shared) by a particular CATV channel can be useful in troubleshooting CATV problems. Table 1 can help you determine CATV channel frequencies from the cable company's decoder, whether your local system uses letter or number designators. Only cable TV channels 2 through 13 correspond directly with the off-air channel frequencies. From that point, CATV channels bound across the spectrum, borrowing slices of RF real estate along the way. Although it's not shown on this chart, in some systems frequencies as low as 5 MHz are used! (Source: *Scientific Atlanta.*)

FCC Rules Governing CATV Service

Part 76 of the FCC rules is on the mind of every CATV system operator. This section governs how he operates his CATV system, and spells out the technical standards he must follow. The *FCC Bulletin* reproduced here in part (FOB Bulletin No. 17), is a checklist CATV operators can use to ensure compliance. Rules 76.601 and 76.611 are of particular interest (and help) to amateurs. Rules 76.613 and 76.614 apply in the special case of cable TV frequencies shared with aeronautical services. Keep in mind that some leakage is tolerated; you might hear leaks during your tone-sniffing survey that are entirely legal. How much radiation is tolerated? FCC rules state that, at 2m frequencies, a leaking CATV signal's strength cannot exceed 20 microvolts per meter at a distance of 10 feet. You'll probably have no way of knowing the actual field strength of any leaks you encounter. Note them all, anyway, following the guidelines given in the main article, for the benefit of the service technician. He'll be able to sort out the strong ones.

Reverse Psychology

In some areas, amateur repeaters at the low end of the 2m band have long suffered QRM *from* leaking CATV signals. The concepts described in this article work for tracking down these leaks and resolving them. Think of it this way: If leaking CATV signals are ruining 2m repeater operation, surely some ham in the area is getting into *their* system, too . . . Use a little reverse psychology to solve this one!

What to do if the Tracer is Off

Occasionally, lightning or equipment failure will knock a cable company's FM band tracer system out of service. If so, you'll have to resort to conducting your search with different equipment. Your 2m mobile rig and 2m HT, or a scanner, will fill the bill. (Be aware of your state's laws regarding scanners in automobiles, if you employ one for the search.) Although these methods won't be as inconspicuous as a Walkman or the FM receiver in your car, they will work. Instead of a tone, you'll be searching for the actual audio portion of a cable TV channel. Here's how: Refer to Table 1 for the audio sideband frequency of a CATV channel within the tuning range of your 2m rigs or scanner. I suggest channels A through E, as these lower frequencies carry farther once they've escaped the cable. After programming your rig, drive or walk the area listening for the audio portion of the TV channel you've targeted. Zero in on it in the same manner as described in the main article for the FM receiver. Use a scanner or your mobile 2m rig with an external antenna for the general search, and an HT for pinpointing leaks on foot.

What to do if the FM Tracer is Gone!

Depending on how progressive, or financially flush, your local cable company is, they may have upgraded their leak tracing system beyond the FM band leak tracer. The new generation of leak tracer uses specialized equipment which searches for actual video radiation on channels A, B, or C. These are aeronautical frequencies, slightly above the FM band. Why the switch from a perfectly good system that was also easy for *us* to track? One incentive for the cable operator is that the new system frees FM band frequencies for commercial use. Cable systems sell an entertainment product, but no one would pay to hear a repetitive whooping tone! (Unless, of course, the customer happens to be a ham—the type who parks his receiver on WWV for hours on end . . .). If your cable system *has* made the switch, use the tracking methods described in "What to do if the Tracer is Off."

Portable TVs as Leak Detectors

It's tempting, but leave the portable TV at home; it won't work well as a CATV leak sniffer. The video component of a leaking signal weakens too quickly with distance. Beyond five feet or so of an egress, a consumer-grade TV will not detect a leak source. Also, note that only CATV channels 2 through 13 correspond directly with the frequencies of off-air TV, so it's difficult to tune the entire range of cable channels.

Neighbor PR

A little premeditated public relations effort with your neighbors goes a long way. Really now, why be hard-headed about it? Try a gentler approach. I always start with: "I'm *sorry* that I'm affecting your TV/radio/telephone . . ." It can be positively disarming, and that can work in your favor. Ditto with the cable company.

What to do when the Problem is Wrapped Up

When an RFI case of any type is finally wrapped up, I make a call to tie the ribbons on it with my neighbor. I do this to get his agreement that it is resolved, or (put the words in his mouth if necessary) "99% better, and acceptable."

Also, call the cable company and leave a message for your contact person to say thanks. Our CATV system manager went so far as to tell me to encourage other amateurs to contact him if they encountered similar problems. You can open the door for your brother and sister amateurs with this follow-up call.

Lastly, write down what you did and learned. Others can benefit from this knowledge! Share it with your local club, repeater group or packet organization.

High-Pass Filters . . . One Thing *Not* To Do

A local amateur, N8LDQ, also experienced serious CATVI shortly after my situation was resolved. Interestingly, he found that a high-pass filter, a typical TVI *solution*, was *causing* the cable system shield breach at a neighbor's home. It was a poorly-shielded L/C unit which let 2m energy in and cable energy out. Although it would have been a fine approach to an HF-related source of TVI in an off-air TVX case, in the cable system it was a Pandora's box (or gateway).

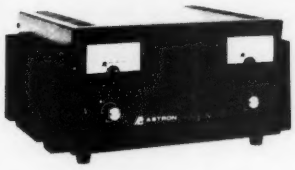
The Cable Company Field Tech and You

Try to meet the cable company technician who performs the investigation and repair work. There are two reasons to do this. First, if you impress him as a technically competent and helpful individual, you'll enhance the image of our hobby. This will help your case, and those who follow you. Secondly, you might *learn something!* (Then pass it on at your next ham club meeting!) Keep in mind the poor tech's lot: He enters the home of strangers, deals with their smoke and pets, must figure out and fix the problem, all while playing referee between the subscriber, his company and possibly even you! If you can ally the CATV company tech, your job of resolving the matter will be more effective, and quicker to succeed.

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277 • FAX (714) 458-0826

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •



MODEL VS-50M

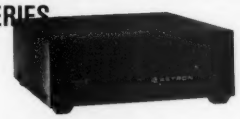
SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

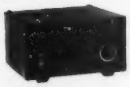
SL SERIES



- LOW PROFILE POWER SUPPLY

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

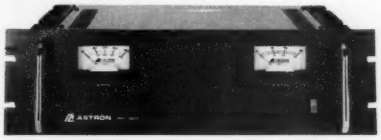
RS-L SERIES



- POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



MODEL RM-35M

- 19" RACK MOUNT POWER SUPPLIES

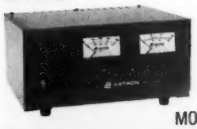
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

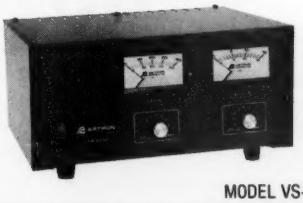
RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

VS-M AND VRM-M SERIES



MODEL VS-35M

- Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

the Cumulative Leakage Index). It's not a good point to open the conversation on, but can be worked in during the visit.

Be prepared, also, for the possibility that your neighbors have not yet registered a complaint with the cable company, and you made it there first.

Once again: The basis of your position is that you are entering and QRMing the cable system because it has some type of shield integrity problem. Likewise, their signal is getting out. You are licensed to transmit over the air on 2m; they are not! The problem is theirs, whether it's a subscriber's poorly-shielded jumper, or their own damaged cables. You've even helped them locate it! Both economics (lost revenue due to mad subscribers) and the FCC inspire them to return their system to a shielded, leak-free condition. Remind them of this, ever so politely. Always end with a polite "thank you," noting you are willing to assist.

CATV CH	CONVTR CH	STANDARD VIDEO	AUDIO
2	2	55.25	59.75
3	3	61.25	65.75
4	4	67.25	71.75
5	5	77.25	81.75
6	6	83.25	87.75
A2	1	109.25	113.75
A1	37	115.25	119.75
A	14	121.25	125.75
B	15	127.25	131.75
C	16	133.25	137.75
D	17	139.25	143.75
E	18	145.25	149.75
F	19	151.25	155.75
G	20	157.25	161.75
H	21	163.25	167.75
I	22	169.25	173.75
7	7	175.25	179.75
8	8	181.25	185.75
9	9	187.25	191.75
10	10	193.25	197.75
11	11	199.25	203.75
12	12	205.25	209.75
13	13	211.25	215.75
J	23	217.25	221.75
K	24	223.25	227.75
L	25	229.25	233.75
M	26	235.25	239.75
N	27	241.25	245.75
O	28	247.25	251.75
P	29	253.25	257.75
Q	30	259.25	263.75
R	31	265.25	269.75
S	32	271.25	275.75
T	33	277.25	281.75
U	34	283.25	287.75
V	35	289.25	293.75
W	36	295.25	299.75
AA	38	301.25	305.75
BB	39	307.25	311.75
CC	40	313.25	317.75
DD	41	319.25	323.75
EE	42	325.25	329.75
FF	43	331.25	335.75
GG	44	337.25	341.75
HH	45	343.25	347.75
II	46	349.25	353.75
JJ	47	355.25	359.75
KK	48	361.25	365.75
LL	49	367.25	371.75
MM	50	373.25	377.75
NN	51	379.25	383.75
OO	52	385.25	389.75
PP	53	391.25	395.75
QQ	54	397.25	401.75

Table 1. Scientific-Atlanta *frequency channel plan.*

Now, reread the last paragraph, pump yourself up, and go! In the unlikely event your contact attempts are rebuffed, a letter to the system manager is the next recourse. Keep copies for reference. You might need them later on. That's it, the third and final step!

In the Meantime

At all times you should be making an effort toward good public relations. If you favorably impress your neighbors with your efforts, and maybe even self-impose some quiet hours until the problem is cleared up, they'll have a better impression of you and of our hobby. (Also, in the future they might overlook the fact that your kW on 40m makes their phone chirp a bit. You can reap the benefits of this PR effort down the road, too!) You should tell your neighbors you are working with the cable company to resolve the problem. Explain as much as they want to know. Keep relations good, and try to enlist their help in your troubleshooting efforts. Besides being the right thing to do, allying yourself with your neighbors is the most prudent path to follow. You may even *need* their assistance at some point to pressure the CATV company to resolve the matter.

If, after all this (and only as a last measure), no positive results are attained, write your FCC Field Office. Addresses are in the ARRL's *FCC Rule Book*. This is a last resort, though. My philosophy is that if you present yourself in a friendly, positive, and reasonable manner, you'll receive excellent response from your cable company. More often than not they will be ready to resolve the problem and will welcome your assistance. Case in point: My local cable company took less than 24 hours to solve my CATVI problem once I brought it to their attention.

I also recommend you obtain a back issue of *QST*, October 1990. On page 42, two Cable TV employees, who also happen to be hams, offer some insight in the "Hints and Kinks" column. Your library can probably obtain a copy of that page through interlibrary loan, depending on their copyright agreement. Another reference well worth obtaining for your shack library is the *Interference Handbook* by William Nelson WA6FQG. It treats a wide range of interference subjects, including that of CATVI, in depth.

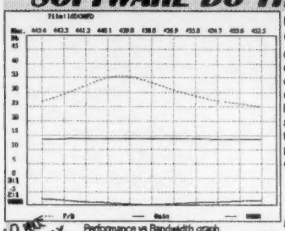
It's late, and time for me to sign off. I'll leave you with these final thoughts: You want this resolved, and you don't want your neighbors ticked at you. They probably blame you, even though it's likely that the problem is the cable system's shortcoming, or even their own fault! Keep their viewpoint in mind though: Everything was fine until "that ham down the street" went on the air. So do things right, be helpful; but remember—*you are licensed* to use the airwaves. Persist! 73

Part 76—Cable Television

Rule/Reference	Suggested Procedure
Leakage Tests	
Rule: 76.601	Conduct leakage tests once a year to show compliance with leakage standards in Rules Section 76.605. Maintain complete test data from annual tests for 5 years. Note: Performing regular monitoring and leakage repairs in accordance with Section 76.614 will ensure that your system complies with leakage standards.
Cable Television Basic Signal Leakage Performance	
Rule:76.611	Conduct a test once a year to establish conformance with the Cumulative Leakage Index.
Interference from a Cable Television System	
Rule: 76.613	Stop operation immediately and correct any condition that threatens radio navigation or other safety-of-life services. Before reactivation, submit an interference report to the Field Operations Bureau of the Federal Communications Commission. Await response from Engineer in Charge before resuming operation.
Regular Monitoring	
Rule: 76.614	Provide for a program of regular monitoring for signal leakage by checking the entire plant every 3 months when using aeronautical frequencies. Maintain a log of leakage sources, probable causes, and corrective action taken for 2 years.

Excerpt from FCC FOB Bulletin No. 17, revised edition, March 1991.

CAN YOUR ANTENNA SOFTWARE DO THIS?



Performance vs Bandwidth graph

Easy to use **Quickyagi** does this and everything else that you'd expect from a high performance yagi optimizer/design program, and does it with...

Blazing Speed!

High accuracy

Great for VHF/UHF

For XT/AT W/640k & Graphics • Co-Pr. optional

12 MORE HOLIDAY SALE

ONLY **$19.95** To 12-31-93

Add $3.00 S&H to orders outside USA
US Check or MO • 3.5 or 5.25 floppy
Az orders add 5.5% • SASE for info

Quickyagi

RAI Enterprises (602)948-9755
4509 No. 48th Dr. Phoenix, AZ 85031

FREE ARRL MEMBERSHIP

(one year new or renewal u.s. membership with purchase)

The WB2OPA LogMaster Plus/Plus

Simply *Sophisticated* All Band All Mode Logging System for IBM PC Compatibles

- Highly Acclaimed CLEAR, UNCLUTTERED User Screens.
- Fastest Data Retrieval of ANY Logging Software.
- Advanced PACKET CLUSTER/QSY Support.
- Support for ALL Major CALL SIGN DATABASES.
- Used By The GORDON WEST Radio School.
- Works with ANY IBM PC (8088 thru 80486).
- FREE UNLIMITED UPGRADES !
- 100 Page Manual + 24 Hour Customer Assistance

$89.95 Complete Download Demo From Our Free BBS (908) 787-2982

Sensible Solutions (800) 538-0001

P.O. Box 474, Middletown, NJ 07748, U.S.A.
Outside Of U.S. And Canada: (908) 495-5066
VISA And MasterCard Accepted 30 Day Money Back Guarantee

PERSONAL COMPUTER REPEATER CONTROLLER

PCRC ™

Speaks for Itself

- ✓ Full Duplex Autopatch
- ✓ 911 Emergency Access
- ✓ Reverse Autopatch
- ✓ Toll Restriction
- ✓ Voice Mail
- ✓ Voice ID's
- ✓ BSR X10
- ✓ Voice/Tone/DTMF Paging
- ✓ Scheduler
- ✓ Links
- ✓ Programmable Courtesy Tones
- ✓ Hardware Logic I/O
- ✓ HF Remote Control
- ✓ Morse Code Practice
- ✓ Remote Base

PCRC/2 Combines the power of your XT/ATplatform with a high quality play and record voice digitizer creating the ultimate **repeater controller.** *from $695*

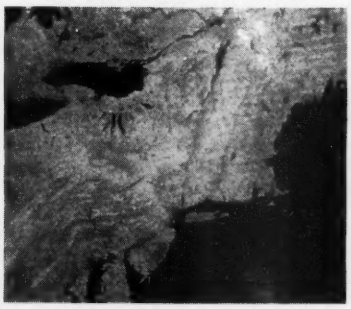
516-563-4715

Fax:563-4716 BBS: 286-1518

VISA

CIRCLE 198 ON READER SERVICE CARD

RECEIVE PICTURES LIKE THIS *ANYWHERE*–DIRECTLY FROM SPACE ON YOUR NOTEBOOK COMPUTER!



MultiFAX offers two fully featured weather satellite demodulators: One model plugs directly into the expansion slot of your IBM compatible desktop PC, the other model interfaces to your PC (laptop, notebook, or desktop) through the parallel (printer) port–perfect for "crowded" computers.

Both versions offer the same powerful capabilities–PLL circuitry for perfectly straight edges on NOAA and GOES satellites. Capture ALL the high resolution the NOAA satellites can provide (2-3 miles) in visible and infrared with a full 12 minute recording.

FEATURES INCLUDE: NOAA, Meteor (Russia), Meteosat, GOES, and HF Fax ■ Direct Write to Disk (Extended or Expanded memory NOT Required) ■ Images have Straight Edges - Even from NOAA and GOES Audio Tape Recordings ■ 256 Colors/64 Shades of Gray, 1024x768 Pixels with SVGA ■ VESA Compatible ■ Zoom to 800% ■ Powerful Image Enhancement ■ GIF File Output ■ False Colorization ■ Unattended Timer Recording ■ Calibrated IR Temperature Readout ■ Dot Matrix and Laser Printer Output ■ Latitude/Longitude and Map Overlays (USA Included) ■ Reference Audio Tape of Actual NOAA, Meteosat, and HF FAX Transmissions ■ Clear, Complete User's Manual ■ Demodulators with Software start at $289 ■ Much More ...

Call or Write for Detailed Information

MultiFAX · 143 Rollin Irish Road · Milton, VT 05468
MasterCard and Visa · 802-893-7006 · Fax: 802-893-6859

Move Up In Class with

AMECO

Books and Code Courses

Upgrade your ticket with Ameco's help.

FCC Test Manuals contain all the latest, official FCC/VEC test questions with answers. Plus, easy-to-understand discussion of each correct answer. Excellent preparation for all classes of amateur exams.

Novice Class	Cat. #27-01 ...	**$5.95**
Novice Class Theory Course	Cat. #23-01 ...	**$6.95**
Technician Class	Cat. #28-01 ...	**$5.95**
Codeless Technician Class	Cat. #78-01 ...	**$9.95**
General Class	Cat. #12-01 ...	**$5.95**
Advanced Class	Cat. #26-01 ...	**$5.95**
Extra Class	Cat. #17-01 ...	**$5.95**

With our help, learning code is easy.

Ameco Code Courses on cassette tapes to help you prepare for the code test at the next level.

Novice Course (0-8WPM)	Cat. #100-T ...	**$5.95**
Senior Course (0-18WPM) 2 tapes	Cat. #101-T ..	**$10.95**
Advanced Course (8-18WPM)	Cat. #103-T ...	**$5.95**
Extra Class Course (13-22WPM)	Cat. #104-T ...	**$5.95**
General QSO Course	Cat. #105-QT ...	**$5.95**
Extra QSO Course	Cat. #106-QT ...	**$5.95**

Code Course for the PC for IBM PC/XT/AT or compatible. User friendly, random characters, send text from external data files, quiz sessions, all at any speed and tone. Includes Code learning book. (Specify 5-1/4" or 3-1/2" disk) Cat. #107-PC **$19.95**

You can find AMECO books and tapes at your local amateur radio dealer.

AMECO CORPORATION

224 East Second Street ▪ Mineola, NY 11501
Tel: (516) 741-5030 ▪ Fax: (516) 741-5031

All products available directly, please add $2.75 for S & H.
Please write or call for complete catalog and price list.

CIRCLE 29 ON READER SERVICE CARD

by Dave Martin W6KOW

Number 6 on your Feedback card

North Olmstead Amateur Radio Depot
(NOARD, Inc.)
29462 Lorain Rd.
N. Olmstead OH 44070
Telephone: (216) 777-9460
Price Class, partial kit: $27.95

The HANDI-Finder

Build this versatile, accurate DFer semi kit in an evening.

Reasons for owning radio direction-finding equipment are many. DF gear can be used for locating a source of unintentional interference, documenting jamming, or for what is probably the best justification of all: The fun of T-hunting with a local group of transmitter hiders and hunters.

To get beyond the hand-held-next-to-the-body method of determining the bearing to a transmitter, some specialized gear is needed. Even at VHF and UHF, often-cumbersome DF antenna arrays are often seen connected to exotic equipment carried by serious DFers. By contrast, the HANDI-Finder DF device marketed in partial kit form by North Olmstead Amateur Radio Supply Depot is small enough to be hand-held, is easy to use, provides a sharply defined bearing, and is inexpensive. Its only apparent disadvantage is 180-degree ambiguity; if you don't know the general direction of the signal, you will have to move until the bearing changes to solve the problem of whether you are receiving the "front" or "back" of the signal.

Designed by Bob Leskovec K8DTS and based on a circuit published for use by the Coast Guard Auxiliary, the HANDI-Finder becomes the antenna for an ordinary hand-held radio on either FM or AM. A carrier is needed to make the system work. The HANDI-Finder works by switching at an audio rate between two antennas. In addition to hearing the signal's modulation, the operator hears a constant audio tone—until the plane of the two antennas is perpendicular to the signal path. The tone then nulls sharply, indicating the bearing to the target transmitter, which is 90 degrees to the antenna plane. Modulation on the carrier is unaffected; only the tone nulls.

"Getting into the open, however, demonstrated that the HANDI-Finder works as advertised."

How It Works

Powered by a 9 volt radio battery, the circuit is based on a single CD4047B IC that contains an oscillator and a flip-flop that provides complementary symmetrical square-wave outputs. Switched at an audio rate between two antennas, the switching-rate audio tone is heard unless both antennas are receiving the signal at the same time and are therefore in phase.

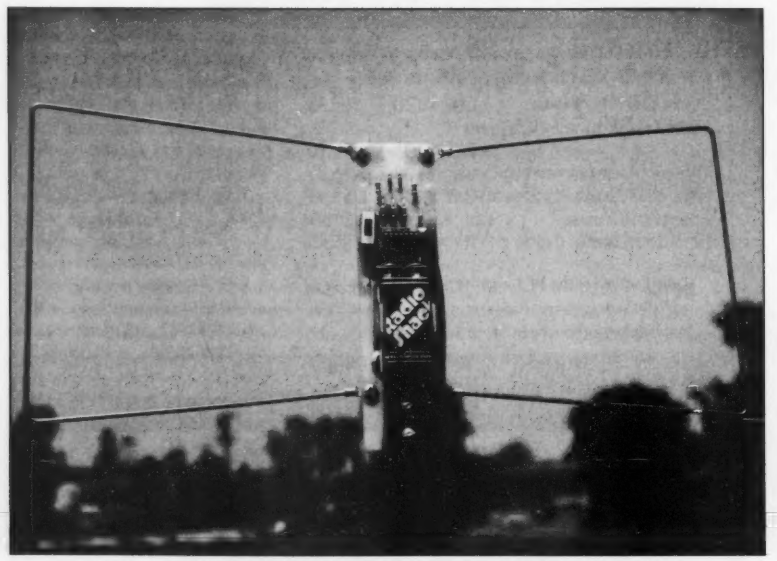


Photo A. The HANDI-Finder kit was easy to assemble in less than an hour.

Building It

The North Olmstead kit includes a 1-5/8" x 6" circuit board with all of the electronic components mounted on the board. Working carefully, I finished the circuit board in 45 minutes. Not included in the kit are the antenna elements, coax and connector, handle, battery, and two 1/8" pop rivets to mount the battery holder.

For antenna elements, I used two 18" lengths of 3/32" brass welding rod. (My nearby welding supply store simply gave me two rods—enough for two sets of antennas—rather than writing up such a small order.) The vertical parts of the antennas are the receiving elements, and the distance between them can be optimized for a particular frequency band. For DF work mostly on 2 meters, I settled for a spacing of about 14 inches. After forming the U-shape elements, I soldered crimp-type wire connectors that are bolted to the circuit board.

The 13-page construction and operations manual suggests using a paint-roller handle to hold the HANDI-Finder. I chose a $1.42 plastic model that is threaded at the bottom and fits a painter's extension pole. A vise and hacksaw came in handy. Attaching a 6-foot length of 50 ohm coax and a BNC connector completed the building project.

Using the HANDI-Finder

First experiments were near my house—too near, as it turned out. The manual notes that used indoors, too close to buildings or even large trees, multipath signals will provide multiple nulls and no clear indication of bearing. Early experience confirmed this.

Getting into the open, however, demonstrated that the HANDI-Finder works as advertised. The audio tone is apparent even on weak signals, and there's a sharp null when the antenna array is perpendicular to the bearing to the transmitter.

The final test was to talk my wife into driv-

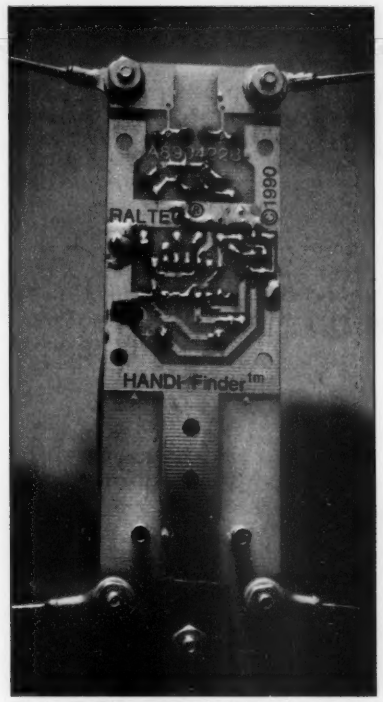


Photo B. The compact, lightweight unit is powered by a 9V battery and mounted on a paint-roller handle.

ing around as I simulated a T-hunt with the HANDI-Finder on its paint pole outside the car. I cheated by knowing approximately where the transmitter was—the continuously-broadcast, low-power ATIS (automatic terminal information service) AM signal associated with the control tower at an airport about six miles from my house. This target was picked because I knew I could get quite close to the transmitter without driving to the top of a mountain.

We played the game. First we solved the ambiguity problem by driving far enough to get a consistent bearing shift. I found that "picket fencing" associated with weak signals heard while underway mobile prevented getting a distinct null; we pulled to the curb a lot. Within 20 minutes, though, we were close to the airport, and driving around it confirmed that the ATIS antenna is on top of the control tower.

The Bottom Line

The HANDI-Finder works well on any carrier-based signal that its IC can hear. By changing the antenna elements, the unit should work as low as 50 MHz and as high as 450 MHz. The circuit could also be used with a pair of directional antennas that would solve the ambiguity problem from one location—at the expense of hand-held portability.

In its simplest form, using a hand-held radio with a HANDI-Finder offers versatile, accurate, easy-to-use direction finding for about $35. How could you beat that? 73

"BRONX BOMBER BERNIE"

...presents the best way for NEW HAMS to upgrade your skills. If CW is frustrating, here's the decoder/tutor for you.

All hams, and SWL listeners, too, will enjoy years of visual decoding.

"In my 50 years in radio, this is the best decoder and tutor I've seen. Morse (CW), RTTY, AMTOR, SITOR, NAVTEX...all spelled out on a bright LED readout. It's great for viewing what you're transmitting, too!" says Bernie, the B-17 radioman and long-time ham expert. High quality, English construction.

- Touch-button control / 7 function keys
- DPS Filtering aids decoding
- Built-in RS232 port for PC and printer operation
- 12v to 16v DC

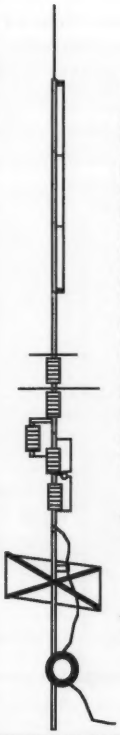
Action Communications
1705 Westminster Drive
Greensboro, NC 27410
(910) 299-1298

Distributor for Enterprise Radio Applications Ltd.

Bernie says, "There's not enough room here. It's worth calling or writing now to find out more!" For FREE information about the Morse Master, call (910) 299-1298 (9 am – 9 pm East. time). For orders only, call 1-800-647-0564.

A NO-RADIAL VERTICAL THAT COVERS 80 OR 75 METERS?

THERE'S ONE NOW!



No, we won't insult your intelligence by telling you that it's a "halfwave" or that ANY vertical will operate more efficiently without a good radial system than with one; it certainly won't! If you want expensive fairy tales talk to our competitors! If, however, you've no room for even the smallest radial system just install the most efficient multiband vertical in the business, the HF9V-X, over our counterpoise kit. You'll not only save a tidy sum but you'll work DX that the shorter and more lossy no-radial "halfwaves" can't touch because both the HF6V-X and HF9V-X use longer active element lengths for higher radiation resistance and greater efficiency on more bands than any of the so-called halfwaves. Ask for our free brochure for complete specs on all Butternut models and receive technical note DLS-1 "Dirty Little Secrets from the Antenna Designer's Notebook") that shows you how to calculate the probable efficiency of any vertical antenna using the manufacturer's own specs so you won't have to learn the truth the hard way!

NEW! **Model HF9V-X (shown to the left) for 80/75, 40, 30, 20, 17, 15, 12, 10 and 6 meters.**

NEW! **Model CPX counterpoise kit for Butternut models HF9V-X, HF6V, and HF6V-X; substitutes for ground or elevated radials. Self-supporting tubing bolts onto base of antenna. Mast not provided.**

BUTTERNUT ELECTRONICS CO.
P.O. Box 1234, Olmito, TX 78575 (210) 350-5711

Five-Element T-Match VHF Yagi

Excellent performance characteristics on 2 meters.

by Marty Gammel KAØNAN

I finally decided to get started on a long-overdue new yagi for my rooftop antenna farm, here in Minnesota. I needed a clean pattern with about 9 to 10 dB gain for FM repeater and simplex work.

I have tried several different types of antennas in the past, but I've never tried using the "T" match with a half-wave balun. So, I looked in the *ARRL Antenna Book*, 15th edition, for guidance. The balun looked easy.

Due to our harsh winters, I needed to enclose the balun, and I also needed a good solid mount for the "T" match feed point. I chose a plastic box from Radio Shack that measured 2-1/2" by 4-5/8" to house the balun. The beam itself was easy, using a 5'-long square boom from an old TV antenna as a starting point. After removing the old elements, I decided to use a close standard spacing of 13" for reflector-to-driven-element spacing. I wanted a close-spaced first director, so I used 9" for driven-element-to-first-director spacing. For second and third directors, I used 15-1/2" and 17" spacing. The 1"-square boom was big enough for this small, 5'-long antenna. I used 3/8" diameter aluminum tubing for all the elements and the "T" match bars.

Photo A. Balun assembly, ready to install.

As an extra feature on this antenna, also from the *ARRL Antenna Book*, 15th edition, I added a ferrite bead choke on the quarter-wave line section of the balun. The local electronic surplus house proved to be a source for cheap ferrite beads. I also wound the half-wave section of coax into a four-turn choke to fit into the plastic box. The combination of the ferrite beads and the four-turn choke gives good isolation of the feedline and avoids radiation from the feedline shield. The dimensions for the "T" bars came from standard design lengths for gamma match parts. The "T" match design gives a very clean design, without skewing.

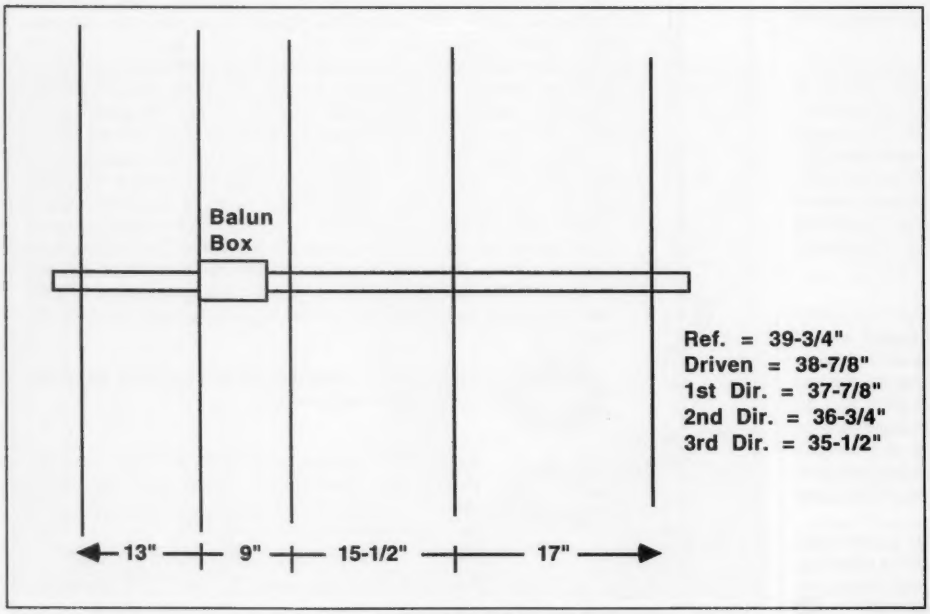


Figure 1. Five-element 2 meter beam.

Building the Beam

Once all the old elements have been removed from the boom, mark where you need to drill to mount all five elements. I found that by mounting the elements in the center of the boom, the spacing for the "T" bar straps was more manageable. The beam will also look better. If you can use a drill press to make the element holes, they will probably be more exactly perpendicular to the boom. After the holes are drilled, try

fitting the 3/8" tubing in each hole and check for squareness to the boom with a square.

Cut all the elements to length, and flatten one end of each of the two 6-1/2" match bars—about 1/2" will do. Drill a 1/8" hole in the flattened area and round off the corners (see Figure 2). Attach all five elements to the boom using the 1" stainless steel screws.

Now drill holes for mounting the SO-239 and the 1" #8 bolts in the plastic box, and attach the SO-239 with three of the four bolts (see Photo B).

Assembling the Choke and Balun Assembly

Start with a piece of RG-59U about 14" long and prepare both ends as shown in Figure 2. Do the same to a 26-1/2" piece for the other balun section. Allow 3/4" on each end of both coax sections for dressing the ends. Wind the longer section of coax into a four-turn coil. Tape the coil temporarily in a couple of places, just to hold it until the finished balun is installed in the plastic box. Solder the shields from both sections of coax together (see Photo A). Install the balun assembly in the balun box; be certain all connections are correct. Install a closed-end crimp-type connector on each end of the center conductor of half-wave coax. Install the 1" #8 bolts through the crimped connectors using washers, and apply a washer and nut to the outside of the plastic box. After doing this, remove the tape from the coil. Install as many ferrite beads as you have room for on the end of the quarter-wave coax section; I had room for six ferrite beads. Solder a closed-end crimp-type connector to the shield and then connect it to the fourth mounting bolt for the SO-239 panel-mount fitting. Solder the center conductor to the center terminal of the SO-239.

Apply Crystal-Cote or some other type of sealer to everything in the balun box. Attach the "T" match bars to the balun box, and bend the ends of the metal strapping around the driven element and match bar. Then drill holes to bolt the straps to the tubing (see Photo B). You will need about 1-3/8" between the "T" bars and the driven element. Spacing for the strap should be about 4" from the center of each 1" #8 stainless steel bolt on the balun box. Fashion a mounting bracket to connect the SO-239 to the boom. It must be a metal bracket to provide the needed electrical connection between the boom and the balun. I used a piece of plumber's perforated strapping that was in my junk box, and cut it to shape with tinsnips. Mount the bracket to the boom with a sheet metal screw (see Photo B). Drill a weep hole in the lowest corner of the balun box for drainage once the box has been mounted on the boom.

Check all connections, nuts, bolts, and screws, and then mount the antenna on a non-conducting mast, ready for tuning. Tape the coax to the boom and bring the coax down the mast, away from the antenna.

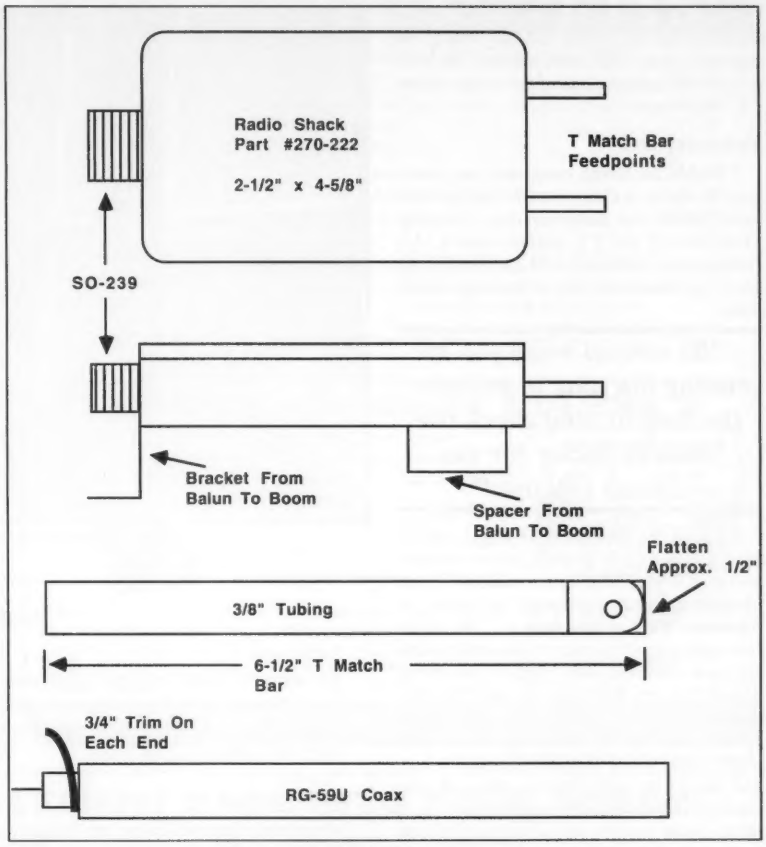


Figure 2. Balun box for 2 meter yagi.

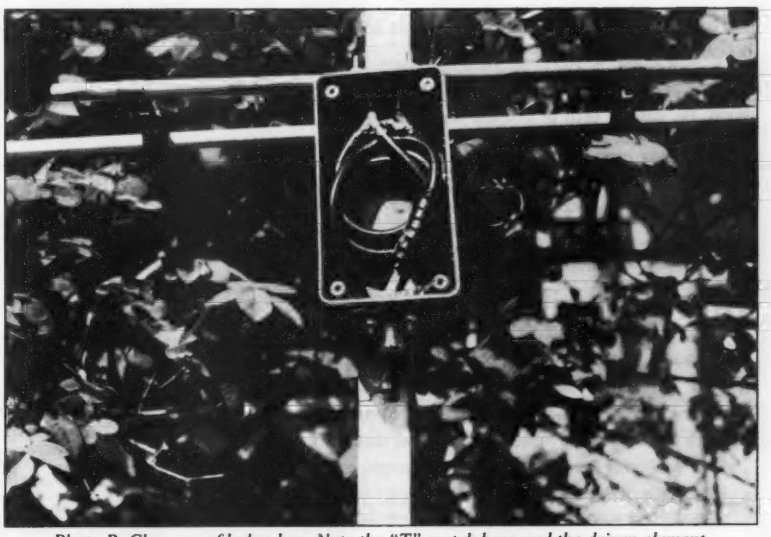


Photo B. Close-up of balun box. Note the "T" match bars and the driven element.

Tuning the Completed Antenna

Tuning the antenna is easy. Connect the coax, SWR meter, and your radio to the antenna. Check the SWR at the top, center, and bottom of the frequency area of design. By noting the pattern of the SWR curve you will know whether to move the match bars in or out for the best match. Move only about 1/8" at a time, rechecking the SWR curve as you go.

Mine was very close to the center of the designed-for frequency, and only had to be adjusted about 1/8" from the text. *Be sure to make all adjustments of the straps on the "T" bars equal.*

Builder's Notes

I bought the ferrite beads and the plastic box to make a clean weatherproof feed point, but all the aluminum came from my stockpile of old TV antenna parts. All hardware is common, and can be bought from any local hardware or building supply store.

***"Be careful when you are cutting the coax to measure the lengths, and* check the velocity factor for the coax you use."**

I cut all the aluminum to length with a tubing cutter; this gives a more finished end than if you cut it with a hacksaw. Each element is installed through the center of the boom and fastened with a 1" #8 stainless steel screw (two screws are not needed for each element). Any type of non-metal spacer that you have may be used for supporting the balun box, to give the proper spacing for the "T" bar straps. I put a 1" sheet metal screw through the plastic box and spacer to hold them in place. If you cannot find an old TV boom, most local scrap metal dealers sell aluminum square and round tubing.

Be careful when you are cutting the coax to measure the lengths, and *check the velocity factor for the coax you use*. My RG-59U had a velocity factor of 66%. The number of ferrite beads is not critical, but they do stop radiation back down the coax shield. Be sure to drill or file the hole for the center of the SO-239 just big enough, but not so big that you get a sloppy fit—it does have to seal out the weather. Tune the antenna before you weatherproof and seal up the plastic balun box in case you may not have wired the connections right. Make nice neat pigtails on your coax ends so that they will be easier to attach. This design, with its close spacing, gives a very clean pattern of radiation, with at least 9 dB gain and a front-to-back ratio of 32 dB.

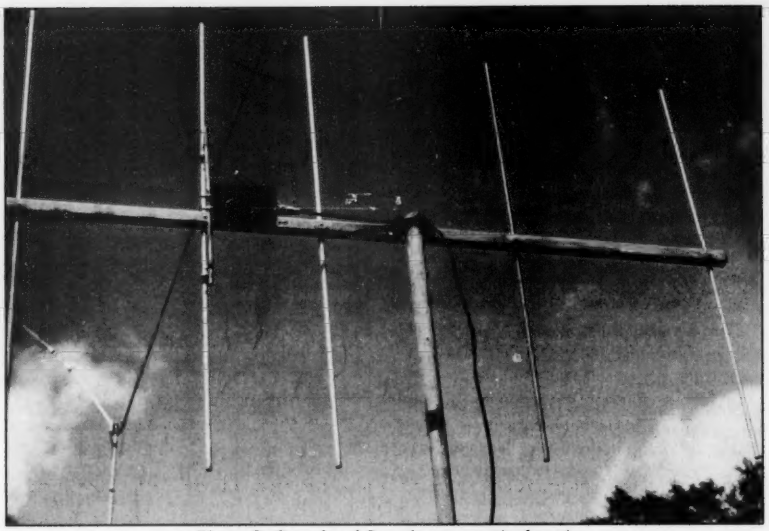


Photo C. Completed five-element vertical yagi.

Tools List

Electric drill
3/8" drill bit (for holes in boom for elements)
1/4" drill bit (for removing old elements from boom)
3/32" drill bit (for #6 bolt holes for SO-239 mounting)
5/32" drill bit (for #8 screw holes)
Tinsnips
Electrical tape
Waterproof sealer (for balun; can be spray or brush-on)
Plumbers' strapping or thin copper or aluminum (for balun, and "T" bar to driven element mounts)
(Optional) drill press for drilling all holes
(Optional) 9/16" drill bit for SO-239 to balun box center hole, or you can use a 1/2" drill bit and file as I did.
Solder and soldering gun (for crimp type connectors inside balun)

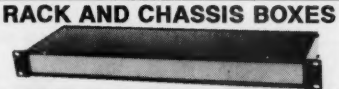
Many thanks to John Berglund KØUBA for his help in editing. If you have any questions, send them along, with an SASE, to me at 1703 Hewitt Ave West, St. Paul MN 55104-1128. 73 and happy hamming.

Parts List

5'-long 1"-square aluminum boom (old TV antenna type)
2-1/2" by 4-5/8" plastic box (Radio Shack #270-222)
3/4" by 1" spacer (wood, plastic, etc. for balun box mounting)
5 to 8 ferrite beads to make a ferrite choke (see text)
12.5" section of RG-59U coax (finished length) (see text)
25" section of RG-59U coax (finished length) (see text)
2 pieces 3/8" by 6-1/2" aluminum tubing ("T" match bars)
1 piece 3/8" by 39-3/4" aluminum tubing (reflector element)
1 piece 3/8" by 38-7/8" aluminum tubing (driven element)
1 piece 3/8" by 37-7/8 aluminum tubing (first director)
1 piece 3/8" by 36-3/4" aluminum tubing (second director)
1 piece 3/8" by 35-1/2" aluminum tubing (third director)
2 #8 by 1" flathead bolts for attaching "T" match bars to balun box
6 #8 by 1" flathead self-tapping stainless steel screws (for elements)
2 #8 by 1" flathead self-tapping stainless steel screws (for balun mounting)
4 #6 by 3/8" flathead bolts with nuts & washers (for SO-239)
1 SO-239 panel mount fitting (for feedline attachment on balun box)
2 1/2" by 3" metal straps (for attaching "T" match bars)
4 #6 by 3/8" flathead stainless steel bolts with nuts & lock washers
3 crimp-type closed-end connectors (for coax connections inside balun)

You may have to find a few assorted bolts and washers in your junk box to complete this antenna (see text.)

RACK AND CHASSIS BOXES



RACK CHASSIS

MODEL	DESCRIPTION W x D x H (inches)	PRICE $
1RU5	19 x 5 x 1.75	30.85
1RU7	19 x 7 x 1.75	33.10
1RU10	19 x 10 x 1.75	35.25
2RU5	19 x 5 x 3.5	33.10
2RU7	19 x 7 x 3.5	35.25
2RU10	19 x 10 x 3.5	37.50
3RU5	19 x 5 x 5.25	41.90
3RU7	19 x 7 x 5.25	44.10
3RU10	19 x 10 x 5.25	46.30

METAL CABINETS

MODEL	DESCRIPTION W x D x H (in)	PRICE $
MC-1A	4 x 3 x 2	16.50
MC-2A	6 x 3 x 2	18.75
MC-3A	8 x 3 x 2	20.95
MC-4A	4 x 4 x 3	18.75
MC-5A	6 x 4 x 3	20.95
MC-6A	8 x 4 x 3	23.15
MC-7A	4 x 7 x 4	20.95
MC-8A	6 x 7 x 4	23.15
MC-9A	8 x 7 x 4	25.75

USA AND CANADA ORDERS (800) 634-3457
FAX ORDERS (800) 551-2749
SESCOM, INC., 2100 WARD DRIVE
HENDERSON, NEVADA 89015 USA
TECHNICAL HELP (702) 565-3400
VISA AND MC ORDERS SHIPPED GROUND AT NO CHARGE (48 STATES)

CIRCLE 167 ON READER SERVICE CARD

KITS! KITS! KITS!

No. 1 in High Quality Educational Kits

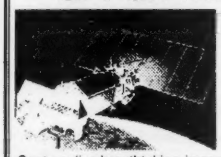
- FM Transmitter, 3v supply, range 400 yards.....$19.95
- 2 Stage FM Transmitter, our most powerful to date.....$24.95
- Sound activated switch for tape recorder.....$19.95
- FM Telephone Transmitter, range 200 yards $19.95
- LM386 Audio Amplifier, variable gain.....$14.95
- DTMF Decoder/Panel Meter, 16 digit LCD display $54.95
- 68 HC705K1 Micro-controller Kit $49.95

DIGITEQ
10 Howard Street
Buffalo, NY 14206
(716)852-0449
FAX (716)852-5042

All designs fully tested and guaranteed to work.
Excellent documentation with schematic to explain how it works. PC Boards have silk screen overlay on the top for component placement.

ORDER YOUR KIT TODAY!
Please send $1.00 for complete listing of over 30 Kits or $5.00 for (100+ items) Surveillance/Counter Surveillance Catalog.

SPY ON THE EARTH



See *live* on your PC what satellites in orbit see

Capture *live* breathtaking images of the Earth for fun or profit. Zoom in up to 20X. Send $39 check or M.O. ($45 air, $50 overseas) for our *fantastic* 12 diskette set of professional quality copyrighted programs (IBM type) that does satellite tracking, image acquisition, image processing, 3-D projections and more. Direct reception from the satellites guaranteed worldwide without a satellite dish. Schematics included for interface. For FREE information log-on to our bulletin board anytime at: (718) 740-3911.

VANGUARD Electronic Labs
Dept. A, 196-23 Jamaica Ave.
Hollis, NY 11423 Tel.718-468-2720

Heterodyne Headache #14.226.5

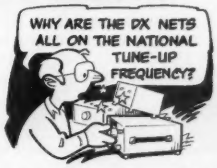
Get fast relief with a **Magic Notch®**
automatic notch audio filter

Magically removes all heterodynes caused by tuners, carriers, CW, computer RFI and other similar QRM!

Why listen to carriers?
The MagicNotch filter:

- is fully automatic. No tuning is necessary.
- easily installs between the rig and an external speaker or headphones.
- can be left on all the time while operating SSB.
- shows filter operation with its 2 color LED.
- allows you to work an s4 SSB signal under a 20 over 9 carrier.
- requires 12 VDC—usually available from the accessory jack on your rig.

30 day money back guarantee



$109.95 MasterCard VISA

Shipping & handling $5.00
Foreign orders $10.00

j-Com · 793 Canning Pkwy · Victor NY 14564 · (716) 924-0422 · FAX (716) 924-4555

CIRCLE 55 ON READER SERVICE CARD

PUT SOME EXCITEMENT BACK INTO YOUR HOBBY!

73 Amateur Radio Today

No other magazine brings you the exciting world of amateur radio like *73 Amateur Radio Today.*

- Equipment reviews you can use.
- Construction projects for all abilities.
- More antenna articles than any other magazine.
- Monthly columns covering the exciting worlds of RTTY, ATV, microwaves, QRP, DX foxhunting and more.
- "Never Say Die," Wayne Green's monthly view of the world of amateur radio.

To subscribe by phone
Call: 1-800-289-0388

– 12 issues for $19.97 –
That's a 43% savings off the newsstand price!

73 Amateur Radio Today
70 Route 202 North
Peterborough, NH 03458
(603) 924-0058
Fax (603) 924-9327

❑ **YES! I want some excitement in my hobby.**
Send me 12 issues of *73 Amateur Radio Today* for only $19.97.

NAME **CALL**

ADDRESS

CITY **STATE** **ZIP**

____ **Payment Enclosed** ____ **Charge my:** ____ **MC** ____ **VISA** ____ **AMEX**

Card Number **Exp. Date**

Newsstand Rate $35.40. Basic Subscription rate $24.97. Allow 4-6 weeks for first issue.
Canada add $7.00 plus $1.40 GST. Foreign add $19 surface/$42 airmail.

G9312G887

Remote Tuned Active Antenna

Tune this easy amplified HF antenna without leaving your chair.

by Ken Cornell W2IMB

The March 1993 issue of *73 Amateur Radio Today* contained an article that I wrote covering an active antenna using a MOSFET. As described, it is a very broadband device. By adding a tuned input circuit, a desired frequency range coverage can be increased in sensitivity and selectivity. The problem arises as to how to tune the remote antenna from the radio shack.

The practical solution is to use a varactor, also called a tuning diode. A varactor acts as a capacitor with an adjustable value which can be changed by applying a variable positive bias voltage.

The antenna circuit is shown in Figure 1. The varactor (V) is placed across the tuned circuit (L1/C1) in series with a 0.1 µF capacitor that acts as a voltage blocker and a bypass. The variable voltage is fed to the varactor via an RF choke.

Due to the basic design, the antenna is basically a monobander; however, the construction cost is minimal and two antennas can be fabricated from a 10' length of 1-1/2" white PVC pipe.

Varactors are not a common item found in every mail order catalog, but I have found two sources: Hosfelt Electronics, 2700 Sunset Blvd., Stuebenville OH 43592; and DC Electronics, P.O. Box 3203, Scottsdale AZ 85271. Hosfelt has a variety and I have used their Motorola type SMV16623M (catalog #MV1662/S) that comes in three matched units for $1. DC Electronics offers a variety of sizes that include AM tuning diodes with capacity ranges at 450 pF. I have ordered some of these to try out.

The tuned circuit (L1/C1) and the varactor (V) have to be resonant through the desired amateur band. For 80 meters, I used a small 5/16" diameter by 1" long coil form and wound 50 turns of #28 enamel wire. C1 is a 5-to-6-mm 50 pF trimmer. Try 100 turns for 160 and 25 turns for 40 meters. I usually wind more turns than my target value as it is easier to remove turns than add them. A small slug tuned form would also help in zeroing in on the desired range.

I used a 1-1/4"-wide by 3-1/4"-long piece of perf board for the circuit and mounted the parts on both sides to permit insertion in the PVC pipe. Pipe caps are used at both ends and the coax cable is fed through the bottom cap. The antenna is a piece of 1" diameter aluminum tubing 4-1/2' long. Assembly is the same as described in my original article.

The receiver coupler is shown in Figure 2. The variable voltage output to the varactor is fed through a length of insulated hook-up wire that is taped to the coax cable. A 6-32 S.S. machine screw is mounted in the base pipe cap to accept same.

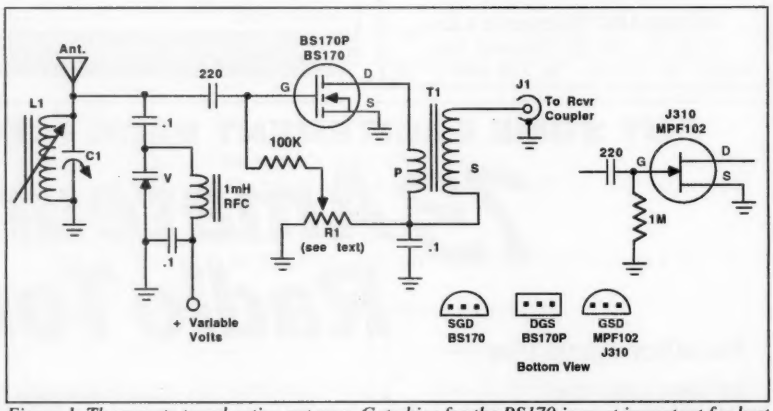


Figure 1. The remote tuned active antenna. Gate bias for the BS170 is most important for best performance. I used a 100k potentiometer for R1 and, after the proper setting was found, I measured the resistance each side of the potentiometer and replaced with same value 1/8 watt resistors.

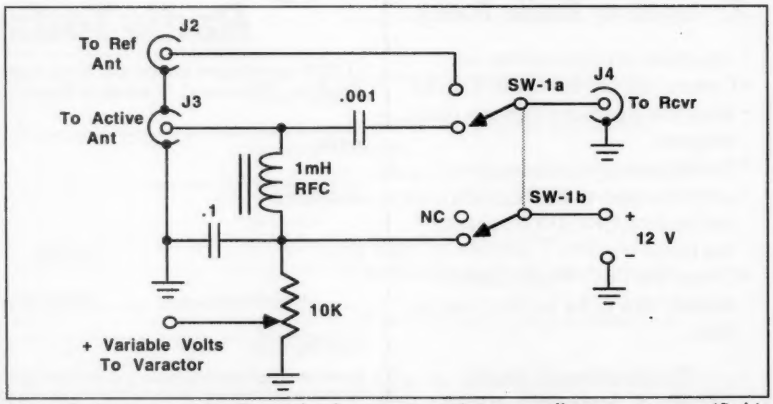


Figure 2. Receiver coupler. Except for the varactor tuning parts, all parts are as specified in my original article.

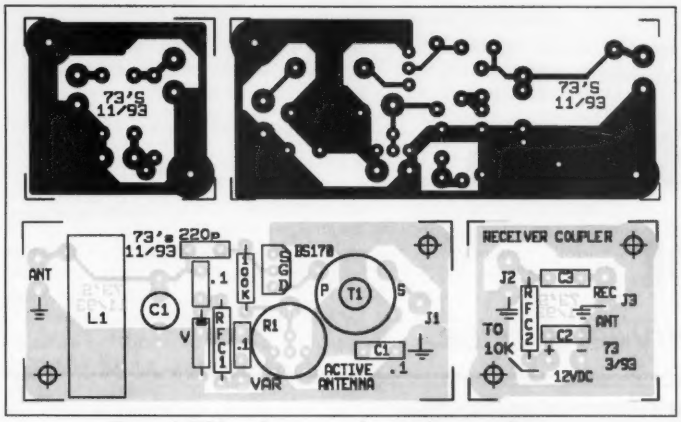


Figure 3. PC board pattern and parts placement diagram.

For the experimenter, a JFET can be substituted for the MOSFET. This minor circuit revision is shown in Figure 1a. 73

Parts List

L1	To suit frequency range desired. I would suggest that you consider RF chokes for the inductance. They are cheap and come in many values to suit any frequency range desired. Consult your L/C vs. Frequency Chart (found in most handbooks).
C1	50 pF trimmer capacitor. Used for frequency adjustment if needed.
V	Varactor. I suggest using VMAM109. It has a range of 450 pF @ 1 volt and 30 pF @ 9 volts (DC Electronics).
Capacitors	Are all disc type with 35 volt rating.
Resistors	All 1/4 or 1/8 watt carbon type.
R1	100k potentiometer. RS #271-284 or equivalent. See text.
R2	10k potentiometer. RS #271-1715 or equivalent. (Addition to the original receiver coupler design.)
RFC	1 mH for HF and higher values for MF to LF.
T1	See text.
SW1	SPDT switch.
J1, J2	Your favorite coax connectors.
BS170, BS170P	Available from Digi-Key Corp., P.O. Box 677, Thief River Falls MN 56701; (800) 344-4539.

Drilled and etched PC boards are available from FAR Circuits, 18N640 Field Ct., Dundee IL 60118, for $4.50 plus $1.50 S & H.

Great Gift Ideas!

The Advertisers in this issue are available to help you with your Holiday Shopping!

Call them Today!

BackPack Beam?

The little rig and 20 meter HalfSquare rode feather light in my pack as I followed the trail up into tall timber. With 3 hrs till dusk I made camp. Two tosses and HalfSquare was ready at 50 ft. I could hear to eternity—even the smallest signal sang clean above a silky silence. And miracle—by dawn my 2 watts were heard on every continent.

10 M	15 M	17 M	20 M	30 M	40 M	Add
$40	$43	$46	$50	$60	$70	$6 P & H

InfoPak $1— Plans: TechNote 122—$7ppd USA

AntennasWest Order Hotline:

Box 50062-S. Provo UT 84605 801-373-8425

CIRCLE 368 ON READER SERVICE CARD

PAY TV AND SATELLITE DESCRAMBLING
OUR BEST YET...1994....OUR BEST YET

Includes the latest cable box and satellite (PLUS, B-MAC) fixes. Lots of schematics and chip files (all new). bullets. ECM's, etc. ONLY $15.95. Our best yet. Other Pay TV editions, volumes 1-5 (all different). $15.95 each. **The Complete Wizzard. VCII PLUS Hacking.** $15.95. **Satellite Systems Under $600.** $12.95. **Wireless Cable Hacking.** $12.95. Hacker Video. $19.95. Any 3/$34.95 or 5/$52.95. **Scrambling News** monthly, $29.95. **Scrambling News Year One** (176 pages). $39.95. Everything listed here and more. $129.95. Includes all our information. Catalog, $1.00. C.O.D.'s are OK, add $6.00.

SCRAMBLING NEWS
1552 Hertel Ave., #123, Buffalo, NY 14216
Voice/FAX (716)874-2088

CIRCLE 36 ON READER SERVICE CARD

2–1000 MHz In One Sweep!

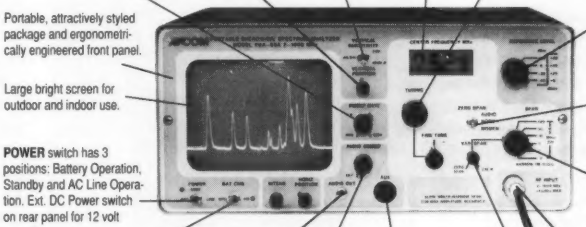
AVCOM's New PSA-65A Portable Spectrum Analyzer

The newest in the line of rugged spectrum analyzers from AVCOM offers amazing performance for only **$2,855**.

AVCOM'S new **PSA-65A** is the first low cost general purpose portable spectrum analyzer that's loaded with features. It's small, accurate, battery operated, has a wide frequency coverage - a must for every technician's bench. Great for field use too.

The **PSA-65A** covers frequencies thru 1000 MHz in one sweep with a sensitivity greater than -90 dBm at narrow spans. The PSA-65A is ideally suited for 2-way radio, cellular, cable, LAN, surveillance, educational, production and R&D work. Options include frequency extenders to enable the PSA-65A to be used at SATCOM and higher frequencies, audio demod for monitoring, log periodic antennas, carrying case (AVSAC), and more.

For more information, write, FAX or phone.



SWEEP RATE controls the speed of the sweep across the CRT.

VERT is used to position the display on the screen.

SCALE selects an amplitude sensitivity of either 10 dB/DIV or 2 dB/DIV

CENTER FREQUENCY 4 digit LCD display

TUNING adjusts the center frequency of the analyzer so that signals of interest appear at the center of the display and their frequency is read out on the LCD.

Portable, attractively styled package and ergonometrically engineered front panel.

Large bright screen for outdoor and indoor use.

POWER switch has 3 positions: Battery Operation, Standby and AC Line Operation. Ext. DC Power switch on rear panel for 12 volt operation.

REFERENCE LEVEL adjusts input attenuator and IF gain. Calibrations in dBm and dBmv are provided.

ZERO SPAN instantly places analyzer in zero span mode and activates audio demodulator for convenient monitoring.

SPAN controls the width of the spectrum being displayed and automatically selects optimum resolution filter.

BAT CHG switch recharges PSA-65A to 80% capacity in approx. 6 hours.

AUXILIARY supports present and future optional accessories for the PSA-65A.

RF INPUT accepts signals to be observed from less than 2 Mhz to greater than 1000 Mhz.

AUDIO OUT drives low impedence earphone or speaker. Internal speaker provided with optional demod.

AUDIO DEMOD activates audio demod board and sets audio level.

VAR SPAN reduces the width of the spectrum being displayed for closer signal examination and enhanced amplitude accuracy.

AVCOM BRINGING HIGH TECHNOLOGY DOWN TO EARTH

500 SOUTHLAKE BOULEVARD
RICHMOND, VIRGINIA 23236
804-794-2500 FAX: 804-794-8284

CIRCLE 27 ON READER SERVICE CARD

Number 9 on your Feedback card

by Charles Warrington WA1RZW

Midland 73-005 Transceiver

A full-featured HT at an entry-level price.

Midland Consumer Communications Division
1690 North Topping
Kansas City MO 64120
Telephone: (800) 643-5263
Price Class: $239

My first 2 meter rig was a digitally synthesized Heathkit mobile which utilized lever switches to change frequencies. It was a neat little unit that took me 40 hours to build and was a dream to use. Then one night, some low-life crumb decided to steal it, along with my '67 Plymouth Belvedere. Two days later the police recovered the car—stripped, of course. No tires, no wheels, no radio! That adventure kept me off the 2 meter band for a while. It also taught me one major advantage of using an HT as a mobile rig: You CAN take it with you when you go.

Sure, you sacrifice some output power and certain conveniences with an HT, versus a dedicated mobile. But, if you live or drive in the city, you'd better have some practical method of protecting your rig from theft. The only sure-fire method that I know of is to yank the rig! Consider the HT as a possible solution. An HT can sit on the seat next to you, keep you in voice with the local repeaters, and offer versatility that a mobile can't match. Simply remove the cigar lighter plug and the BNC coax connector, and you're good to go.

Of course, this illustrates only one of the many reasons why HTs have become so pervasive in recent years. If you're thinking about buying an HT, first you have to get past the Future Shock of what's out there. There are many to choose from! One way to narrow the field would be to ask: How much does a good 2 meter portable cost? Well, how much have you got?

Money is No Object

When I first laid eyes on Midland's latest venture into the amateur radio marketplace, I thought, "Hey! Not bad for a $400-ish HT." I immediately delved into the liquid crystal display and buttons without ever checking into the price. (Herein lies the difference between purchasing and playing with a review unit.)

Well, I kept the test rig by my side for several weeks, happy as a clam, until I noticed the Model 73-005 in a catalog, sporting a *$239 price tag.* What? Midland can offer this sophisticated, surface-mount technology, microcomputer-controlled, 2 meter transceiver for less than 250 bucks? (In case you haven't shopped around, this price falls into the "rock-bottom" range.) So, how good could it be?

First Glances

Now, you're probably thinking, "Yeah, right. For that price it's probably a real no-feature cheapie." But the 73-005 HT is no slouch. This is a nice little radio!

The actual transceiver is a tiny 5-1/2" high by 2-1/8" wide by 1-5/16" deep. (I grew up pre-Nintendo, so I still find myself in awe over the cramming of so much electronics into such a small package.) Still, the Midland is somewhat larger than the very smallest rigs that I have seen. You can attribute much of that size to the big duckie and optional high-power battery. Even so, this unit has a clean look, and is quite small enough.

The LCD panel is easy to read, and it is *flat.* Many HTs on the market have convex panels that are susceptible to scratches. Midland's design avoids that problem.

Tough Enough

I like to carry an HT with me whenever I go mountain biking or hiking. They are very nice to have with you in the woods and in the mountains. You can stay in touch, listen around, or just know that you could summon help in the event of an emergency. One thing you don't need on the trail, however, is a fragile piece of gear.

The new Midland is solid. Very solid. The transceiver is constructed on a die-cast aluminum chassis. It resembles a commercial transceiver, which is no surprise, considering Midland specializes in commercial gear.

This radio is also equipped with a PTT LOCK feature. This deactivates the PTT button to prevent accidental transmitting.

Design

This baby is a tad more conservative in design than many of the latest HTs. It looks more like a police portable than some of those Star-Trek-looking amateur models I've seen lately. Still, I'll give Midland good marks for ergonomics.

The VOLUME and ROTARY CHANNEL SELECTOR controls are easy to adjust without looking at them. The push-buttons on the front pad were designed for daintier digits than mine, but I can still push them one at a time—even

with *my* sausage fingers. These buttons are of the rectangular rubber variety. They feel like the erasers of 16 tiny new pencils.

Say, where's the squelch knob on this thing? It was cleverly "sawed off" at the factory. The owner's manual describes this as a "set and forget" type knob, and I kinda like it. It reminds me of a child-proof cap on a medicine bottle. I don't like to constantly ride the squelch, anyway—it really isn't necessary. Still, if you're a knob twiddler, you may find this feature irritating. Tough twiddling on the Midland.

On the left side of the 73-005 you will find the usual-looking rubber-covered PTT button. Just above it is the FUNCTION button, which combines with the front panel buttons to offer a wide array of features. Below the PTT is a LOCK button which mechanically holds the battery onto the transceiver.

EXTERNAL SPEAKER and MICROPHONE jacks are located on the unit's topside, next to the BNC ANTENNA jack. In between the VOLUME and CHANNEL knobs is a little red LED. This indicator lights when the unit is transmitting. The light becomes dim as the battery weakens, indicating a charge is needed.

On the right side all you will find are a carry strap loop and an EXTERNAL POWER connector. This connector, like the MICROPHONE and SPEAKER jacks up top, has a little rubber plug to help keep water and dirt from entering.

There are two more buttons on the front of the 73-005 you need to know about (aside from the touch pad, of course): the CALL and the SQUELCH/MONITOR buttons. The CALL button will generate a 1750 Hz repeater access code when depressed along with the PTT button. This BURST TONE ENCODER is unusual on rigs manufactured for the U.S. market. The 1750 Hz tone is common in Europe, but rarely used in the States. The SQUELCH/MONITOR button simply shuts the squelch circuit off while it is depressed. Push it to hear weak signals that are barely breaking through.

The LCD display indicates frequency, channel step, and special functions. These include PAG (Paging), DUAL (Dual Watch receive), APO (Automatic Power Off), DUP (semi-Duplex operation), F.L. (Frequency Lock), T.SQ (Tone SQuelch), P.L. (PTT Lock protection), C.SQ (DTMF Code SQuelch), S (battery Save), B (Busy scan—rather than the pause scan default mode), and + and – (repeater offsets). The LCD also displays the memory address number and memory mode. The number line style meter across the bottom functions as an S-meter on receive, and as the RF power meter on transmit.

Special Attractions

The Midland 73-005 has more functions than you can shake a stick at. Let's take a look at some of the highlights:

- •Large Capacity Nickel Cadmium Battery Pack
- •LCD Control Panel
- •Multi-Function Scan
- •20 Memory Channels
- •Repeater Offset and Reverse Switches
- •Tone Squelch + (P/L)
- •Dial Lamp (LCD)
- •Battery Save Function/Auto Power Off
- •Instant Squelch Defeat/Monitor
- •Speaker/Mike and 12 Volt Input Jacks

"Probably this rig's best feature is its hot receiver section."

Note: The Tone Squelch Module is an accessory, as is the oversized (high-power) 12 volt battery pack. A 12 volt wall charger and a speaker/mike are also available.

The 73-005 comes standard with some nice features. The DTMF (Dual-Tone Multi-Frequency) encode touch pad has become a staple in the market. But not all HTs have the decode feature as well, which allows you to emulate a personal pager of sorts. The LCD screen displays the number being decoded and "beeps" when activated.

Probably this rig's best feature is its hot receiver section. The receiver is up to (low-end) commercial specs. 60 dB adjacent channel rejection is better than most. It is a highly selective radio with a very respectable 0.16 µV (12 dB SINAD) sensitivity as well.

The receiver has extended range capabilities. You can dial up some local police and other agencies for the heck of it. You can also hear the National Weather Service. The VCO stays locked from 135 to 170 MHz.

The transmitter will put out 5 watts with an automotive 13.8 VDC power input. The Midland is not real picky about DC power; it will run happily on anything from 5 to 15 VDC. The circuit is reverse-polarity protected. Note that the center pin of the 12 volt input jack is negative.

The transmitter section gives you plenty of choices when it comes to output power level. The B/PT.L button selects HIGH, MIDDLE, or LOW power operation. With the optional 12 volt battery, this will give you a choice of 5, 2.5, or 0.35 watts output. With the standard 7.2 volt battery you can select from either 2 watts out on HIGH or MIDDLE or 0.35 watts out on LOW power.

Semi-duplex operation is available by using two different memory frequencies. The 2/DUP button along with the FUNCTION button will get you into DUPlex mode. You can also swap the transmit and receive frequencies by pushing the C/SC/M along with the FUNCTION button.

You can select a frequency with either the ROTARY CHANNEL SELECTOR, or by direct entry to the keypad. You can adjust the channel steps with the 3/STEP and FUNCTION buttons along with the ROTARY CHANNEL SELECTOR knob. For repeater use, press the 7/SB button along with the Function button to switch from – offset to + offset to simplex operation. The offset is adjustable, too.

The Battery-Save function gives you even more choices. This function allows you to reduce the current drain to 1/3 during receiver standby. In this mode the receiver takes a sample once every single second. This is great for working voice out in the field, but it can be a problem receiving packet. Pressing the 5/SAVE button while pressing the FUNCTION button (located just above the PTT) toggles this feature on and off. The unit also has an Auto-Power Off function.

Midland shipped an accessory tone squelch board with the review unit. The Tone Squelch control allows you to gate a signal through the receiver squelch only when a particular CTCSS (Continuous Tone Controlled Squelch System) tone is being received. On transmit, you can similarly generate this particular subaudible tone to ac-

Continued on page 37

Specifications

Frequency Range	144-148 MHz TX, 130-170 MHz RX		
PLL Lock Range	130-170 MHz		
Modulation Type	F3		
Channel Steps	5, 10, 12.5, 20, 25, 50 kHz		
Antenna Impedance	50 ohm, unbalanced		
Input Voltage Range	5.0-16.0 VDC		
Nominal Voltage	7.2 VDC		
Current Drain (approximate):			
	Transmit	13.8V	
		Hi	950 mA (5W)
		Mid	650 mA (2.5W)
		Low	350 mA (0.35W)
		7.2 V	
		Hi	650 mA (2W)
		Mid	650 mA (2W)
		Low	350 mA (0.35W)
	Standby	0.35 mA	
	Save	0.15 mA	
	Auto pwr off	0.7 mA	
RX	(144-148 MHz ham band only)		
Sensitivity	(12dB SINAD) less than 0.16 µV		
20 dB quieting	Less than 0.25 µV		
Distortion	Less than 5%		
Squelch sensitivity	0.16 µV max		
Audio output power 250 mW	10 % distortion at 8 ohms		
TX			
RF output power	5W (13.8V) max 2W (7.2V)		
Max deviation	+/- 5	kHz	
Freq stability	+/- 10 ppm from -20° C to +60° C		
Spurious & harmonic emissions	Less than -60 dB		
Dimensions	152 x 63 x 34 mm		
Net weight	300 g (with battery and antenna)		

BATTERIES

BUY DIRECT FROM US, THE MANUFACTURER!

Seasons Greetings

12% OFF

ON ALL • REPLACEMENT BATTERY PACKS
MASTERCHARGERS • POWERPACS

FOR THE MONTH OF DECEMBER

MONTHLY DISCOUNTS APPLICABLE TO END-USERS ONLY

Prices and specifications subject to change without notice.

NYS residents add 81/4% sales tax. Add $4.00 for postage and handling.

W & W ASSOCIATES

800 South Broadway, Hicksville, N.Y. 11801

WORLD WIDE DISTRIBUTORSHIPS AVAILABLE. PLEASE INQUIRE.

MADE IN THE U.S.A.
SEND FOR FREE CATALOG AND PRICE LIST

In U.S. & Canada Call Toll Free (800) 221- 0732 • In NYS (516) 942-0011 • FAX: (516) 942-1944

CIRCLE 191 ON READER SERVICE CARD

Radio Fun

"The beginner's guide to the exciting world of amateur radio."

Radio Fun is packed full of information to help you get more fun out of amateur radio. Basic "how-to" articles will get you up and running on packet, ATV, RTTY, DXing, and the dozens of other activities that make amateur radio such a great hobby. You'll get equipment reviews geared toward the newcomer. We'll help you upgrade to a higher class license with monthly columns designed to teach you what you need to know in a fun and exciting way. You'll find it all, and more, in the pages of *Radio Fun*.

Don't wait another minute. Subscribe today for only $12.97 for one year. That's 12 issues of the only ham radio magazine that is geared especially for the newcomer, or any ham who wants to get more fun and excitement out of amateur radio—*Radio Fun*!

12 issues for only $12.97

1-800-257-2346

☐ YES! Sign me up right now! 12 issues of *Radio Fun* for $12.97.

NAME _____ CALL _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Check _____ MC _____ Visa _____

CARD # _____ EXPIRES _____

Class License ___ Year licensed ___ *73* Subscriber ___

QST subscriber _____ *CQ* Subscriber _____

Mail to: *Radio Fun*, P.O. Box 4926, Manchester, NH 03108
[Or call 800-257-2346 (in NH call 625-1163), FAX: 603-669-2835]

Canada add $7.00 plus .70 GST. Foreign add $12.00 surface, $36.00 airmail. Newsstand Rate $18.00. Basic Subscription Rate $14.97.

07N

Midland 73-005

Continued from page 35

cess "closed" repeaters or particular individual stations.

This miniature board took me all of 10 minutes to install, and five of those were spent looking for a small screwdriver. The clamshell housing comes apart lickety-split after removing just four screws. Inside there is a very neat array of microcircuitry. The thumbnail PC board sticks to the main board with its own adhesive backing and a tiny multi-pin plug makes all the connections. To operate the TONE SQUELCH feature, press the 4/T.SQ button while pressing the FUNCTION button. If you want to real get tricky, you can *simultaneously* utilize both the sub-audible TONE SQUELCH and DTMF CODE SQUELCH. Two independent subaudible tone frequencies can be programmed into the memory banks. Tone frequencies are selected via the ROTARY CHANNEL SELECTOR.

Conclusions

For this review, I shoved the Midland 73-005 unit into my backpack, tossed it onto the passenger seat of my car, and clipped it to the handlebar bag on my mountain bike. It's been on hikes in the mountains, to the beach, everywhere. Let's cut to the chase. Money *is* important to most of us and this rig is priced quite reasonably. It offers more features than you will probably need. The receiver is hot and the rig is very sturdy. You can lock the PTT button and the operating mode to prevent improper operation. That's handy if you're active outdoors.

The speaker audio is very good. To get better audio you will probably have to fork over quite a bit more money. I found this to be a cool radio, too. I didn't have a problem with the output power circuitry turning into a hot hamburger during normal use. (I don't usually rag-chew on 2 meters.) The aluminum chassis does a good job dissipating heat.

This is not the easiest HT to program. This article should give you a good feel of the essential operating hieroglyphics. Still, the Midland *will* perform well for you—just don't forget to bring the instructions along. The manual is detailed with plenty of illustrations to get you through.

Midland has made a triumphant return to the amateur radio business after a long hiatus. They have done a fine job with the 73-005 hand-held transceiver. Their next project is a UHF model, which is already in the works.

VISA SLOW SCAN TV with the Sound Blaster! MasterCard

New! Copy 8,12,24,36 sec. B&W, 36 & 72 sec. Color (in B&W), Scotty 1 & 2 (in B&W) with your Sound Blaster compatible sound card. Requires VGA 640x480-256 colors. ONLY$40.00 - Shipping $5 Illinois residents add $2.50 tax

Harlan Technologies 815-398-2683 5931 Alma Dr. - Rockford, Illinois 61108

CIRCLE 187 ON READER SERVICE CARD

TigerTail™ Range Extender for 2 meter Handhelds

• Easy to Use • Unobtrusive • Easily Concealed • Snaps on Handheld • Weighs only 1.3 oz. • Adds No Bulk or Height

• Boosts Signal from Flex & 1/4 wave Antennas • Lowers Radiation Angle • Improves both Receive and Transmit • Raises Low Power Performance • Saves your Battery Pack

AntennasWest Box 50062-B, Provo, UT 84605 Order Hotline 1-800-926-7373

See and Hear the Difference 7.95

CIRCLE 107 ON READER SERVICE CARD

FOR HAMS ONLY FHO

4309 Northern Pike Blvd. Monroeville, PA 15146 (412) 374-9744

FOR ORDERS ONLY CALL (800) 854-0815

SPECIALING IN PREOWNED AMATEUR AND SHORTWAVE EQUIPMENT

BUY • SELL • LOVE TO TRADE

We Carry All Major Brands Of New Equipment

CIRCLE 329 ON READER SERVICE CARD

ONV SAFETY BELT CO.

P.O. Box 404 • Ramsey, NJ 07446

800-345-5634

Phone & FAX 201-327-2462

ONV Safety Belt With Seat Harness

$89.95

OSHA

We Ship Worldwide

Order Desk Open 7 Days/Week

ONV Tool Pouch $15.95

Add $4.00 For Handling VISA M/C CHECK

ONV Belt W/O Seat Harness $74.95

CIRCLE 102 ON READER SERVICE CARD

Great Gift Ideas!

The Advertisers in this issue are available to help you with your Holiday Shopping!

Call them Today!

CABLE TV DESCRAMBLERS

Best Prices in the U.S.A.! Guaranteed to Work!

WE WILL BEAT ANY PRICE!

JERROLD PANASONIC SCIENTIFIC ATLANTA PIONEER

The Newest & the Latest

DMTB-A - all Jerrold Impulse & Starcom series

SA3-DFA - all Scientific Atlantas including 8536, 8536+, 8580, Drop-field

PN-3A - all Pioneer systems

ALSO FTB3, SA3, TZPC145G

24 HOUR SHIPMENTS 30 DAY MONEY BACK GUARANTEE FREE CATALOG & INFORMATION

1-800-772-6244

M-F 9-6 EST

U.S. Cable TV, Inc. Dept.: K73123

4100 N. Powerline Rd. Bldg. F-4 Pompano Beach FL 33073

NO FLORIDA SALES!

CIRCLE 121 ON READER SERVICE CARD

TRANSEL TECHNOLOGIES

A DIVISION OF LJ ELECTRONIC INDUSTRIES

123 East South Street • Harveysburg, Ohio 45032

1 (800) 829-8321

Model TSC1 Transel Suction Cup Mounting Kit $12.95

Model TDC1 Transel Heavy-Duty Hat Clip $12.95

Model TWM Transel Slim Line Window Mount Kit $24.95

Model T144-10 Transel Modified Gain Quarter Wave Antenna $14.95

Write for a Full Line Antenna Catalog at No Cost!

—DEALERS WELCOME—

Made in The USA...Because It Matters!

CIRCLE 11 ON READER SERVICE CARD

Melt Your Way to Better Breadboards

Discover the Macro Surface-Mount breadboard method.

by Brad Thompson N1JIJ

Chances are, you build one or more breadboard versions of your amateur radio projects before you commit them to a printed-circuit board layout, or you may even skip the PC version altogether and simply package the breadboard.

But if the fun's wearing thin and you're "bread-bored," your standard construction method may be at fault—no single breadboarding method meets everyone's needs. For example, perforated grid board and wire-wrap techniques work well for logic and low-frequency analog circuits, but lack an adequate ground plane for RF applications.

Isolated pads carved into sheets of unetched copper-clad laminate solve the RF ground plane problem but are totally immovable, as are through-hole Teflon standoff insulators. Terminal strips soldered onto copper-clad solve the relocatability problem, but they're relatively bulky and add to board height.

Enter the Macro Surface-Mount breadboard method, or MSM for short. Using the MSM technique, you keep your breadboard's copper-clad ground plane intact and install connection pads wherever they're needed. You can easily remove unwanted pads and relocate their replacements and, as Photo A shows, you can even build breadboards on almost *any* substrate—from window glass to business cards.

Best of all, you won't tie up much "bread" in your breadboards—the raw materials cost a penny or two per connection, and the tools you'll need are available nearly everywhere.

What are the secret ingredients? The connection pads consist of disks of thin single-sided copper-clad printed circuit board laminate punched from sheet stock with a $3 hand-held paper punch (see Photo B). Hardware-store hot-melt adhesive secures the pads to the ground plane.

Forming the Pads

Printed-circuit board material consists of one or two layers of copper foil laminated onto an insulating sheet. While most of us are familiar with the thicker sizes sold for fabricating one- or two-sided etched circuit boards, the PC board industry also uses millions of square yards of thinner stock to manufacture the inner layers of multilayer boards.

For MSM breadboard applications, you can use single-sided epoxy/Fiberglas board (commonly designated as G-10 or FR-4 stock). Material of 0.012" insulation thickness laminated with 1-ounce (0.0014") copper works well—a common hand-held paper punch easily penetrates the laminate, and normal levels of soldering-iron heat won't delaminate the copper.

To create MSM connection pads, you slide a piece of laminate into your paper punch and squeeze. The pad will pop out like a miniature tiddlywink unless you place a finger over the punch's exit side.

If the remaining laminate sticks to the punch, work it free with a twisting motion. To prevent cuts while handling the sharp-edged laminate, wear a pair of lightweight cotton gloves.

No one will ever mistake a paper punch for a precision tool, and the fit between punch and die is typically rather sloppy. Thus, squeezing the punch forms a raised lip or burr on an MSM pad's copper surface. If you punch through the board's insulated side (i.e., with the insulation in contact with the steel punch and the copper side against the punch's die) the copper burr overhangs the pad's edges and reduces the insulation path.

Also, epoxy/Fiberglas material acts as an abrasive, further wearing the punch. When the edges of pads exhibit a torn rather than sheared appearance, discard the punch or relegate it to paper and cardboard.

MSM's Electrical Properties

While epoxy/Fiberglas laminate and hot-melt glues offer dielectric strength of approximately 500 volts and 650 to 1300 volts per mil of thickness respectively (i.e. a 12-mil board should withstand 6,000 volts), the practical working voltage for an MSM pad cemented to a ground plane falls well below the dielectric limit.

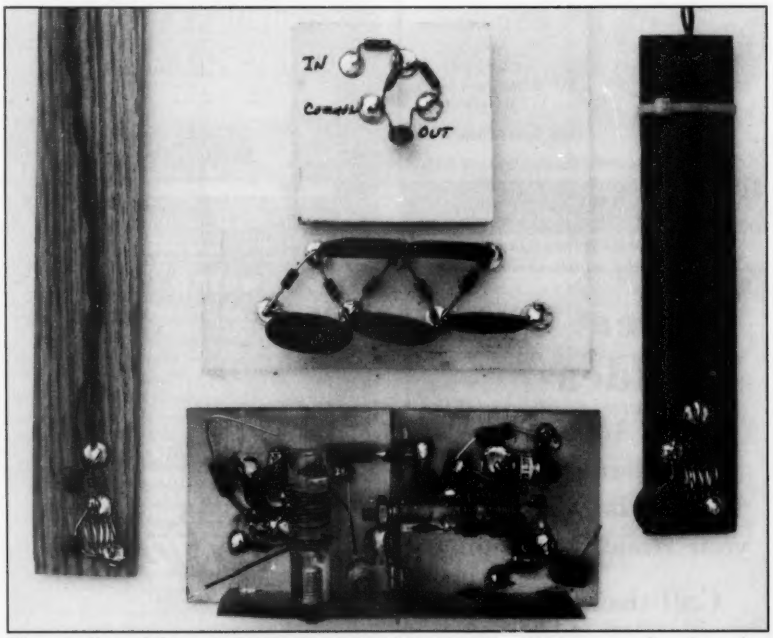


Photo A. Using MSM techniques, you can build circuitry onto almost any surface from plate glass to business cards to wood to Plexiglas.

In practice, the creepage path across an MSM pad's edge from copper to ground plane determines the voltage flashover margin. While a ring of hot-melt glue around and beneath a pad may raise flashover voltage, glue thickness and thus flashover voltage is hard to control.

As a guideline, printed-circuit board design rules impose a 150 volt limit for trace-to-trace clearances of 0.025". Thus, adopting a maximum working voltage limit of 50 volts for a 12-mil (0.012") MSM pad-to-ground plane separation will provide a conservative safety margin. Of course, if you're using an insulating substrate, pad-to-pad flashover and substrate breakdown voltage limits will apply.

Pad area and dielectric layer thickness value determine the capacitance of an MSM pad mounted over a ground plane. For a worst-case assumption of no glue layer, calculated capacitance of a 1/4" diameter copper pad and 12-mil epoxy/Fiberglas dielectric layer is 1.06 pF (picofarads).

In practice, edge effects increase and the thickness of a hot-melt glue layer decreases capacitance. A cluster of four MSM pads measured 1.08 pF per pad, a value reasonably close to the theoretical capacitance.

Dissipation factor (DF), a measure of a capacitor's AC power loss, varies from 0.001 to 0.120 for hot-melt adhesives, a range that brackets G-10 and FR-4 laminates' DF of 0.018—given the small amount of adhesive used, RF losses won't present a problem in most MSM breadboards.

Applying the Glue

Use a sharp hobby knife or single-edged razor blade to shave a 1/8" by 1/8" by 1/16" thick flake from a hot-melt glue stick. Size and thickness of the flake isn't critical, but too little glue won't fully wet a pad's underside and too much glue will form a messy-looking ring around the pad. A little practice will demonstrate the proper amount of glue to use.

Place the glue flake on the substrate using tweezers or needle-nosed pliers. Put an MSM connection pad (copper side up) over or against the flake. Using a small (20 watt) soldering iron, tin the pad's surface with 60/40 rosin-core solder.

As the solder melts, so does the glue, which secures the MSM pad to its substrate after cooling. While the glue remains liquefied, you can slide the pad to a slightly different location. If you incorrectly place a pad, simply reheat and remove the pad. Use a section of copper braid or solder wick to absorb leftover glue.

You can obtain MSM materials and tools locally, with the possible exception of thin-substrate copper-clad PC laminate. If your local surplus outlet doesn't stock the laminate, check mail-order surplus dealers who advertise in *73*.

Also, contact local printed-circuit board manufacturers and PC laminate suppliers for availability of scrap and leftover material. To get started, you can purchase a 3" by 5" trial sample, enough for over 200 MSM pads, from the author for $4 postpaid (see address at end of story).

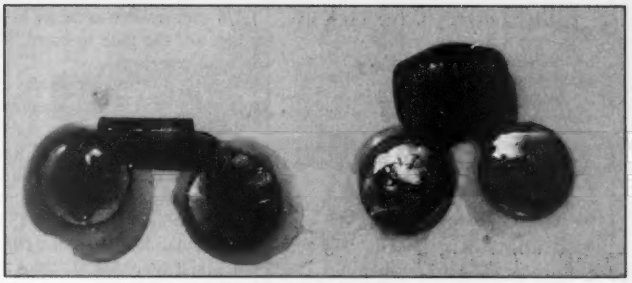


Photo B. A tight-shot of the MSM connection pads.

Assembly Techniques

Before soldering a component to a pad, trim and tin all of the component's leads. Bend a lead to form a "foot" and place the "foot" on the pad. Apply a soldering iron to the lead and pad, simultaneously melting the solder and softening the glue. Adjust the pad's position, if necessary, and remove the iron. Allow the glue to cool for approximately 30 seconds before moving the part or bending its leads.

As noted, MSM pads can slide on a "bearing" of molten glue, but the first component lead soldered to the pad effectively pins the pad in place. While the first connection is the most difficult to make, subsequent connections go more easily.

Use a hemostat or locking tweezers to hold a component while soldering. Grasping the lead between component and connection helps keep excess soldering heat out of temperature-sensitive components.

For best results, use a low-wattage soldering iron—a 20 watt iron with a 1/16" tip works well. To solder leads to a copper-clad ground plane, use a larger iron of 40 to 50 watts capacity. Apply enough heat to make quick, clean connections and minimize softening of the glue securing adjacent component pads.

If you're installing MSM pads over a ground plane, use an ohmmeter to check for pad-to-ground short circuits caused by excess solder or too-long component leads.

To make connections between pads, use light-gauge solid- or stranded-conductor wire. Solid wires hold their shape when bent, an advantage when routing many conductors among pads. You can use thermally-strippable magnet wire for interconnections, but for best results trim and tin individual wires before soldering to pads. Tinned copper wire strung with sections of insulating tubing also works well.

Layout Suggestions

While the MSM method encourages a free-form approach to breadboarding, you'll get best results by planning your layout before you place a single pad. Proceeding from input to output, convert your schematic to a component-placement diagram. Allow a 1/4" circle for each MSM pad at a connection point. If you're using a copper-clad ground plane, allow a margin of approximately 1/4" to 1/2" around the ground plane's edge for mounting holes and a shielding box, if required.

Route power busses parallel with the substrate's edges. In general, you'll find that MSM layouts can closely follow a circuit's schematic diagram, easing troubleshooting and modification.

Given a copper-clad ground plane, there's no excuse for insufficient RF filtering. You can liberally sprinkle bypass capacitors from MSM pads and power-distribution points to ground. When bypassed on either side, a low-value resistor passed through a clearance hole in a shielding partition serves as a feedthrough insulator.

You can use DIP (Dual-Inline Package) components in a predominantly analog- and discrete-component MSM layout via "deadbug" and "porch" techniques. In the deadbug approach, you place the part with its pins in the air and bend power and ground pins to contact MSM pads and the ground plane respectively. Use individual pins as connection points for wiring—AWG #30 wirewrapping wire works well.

As an alternative, you can mount DIP components on sections of perforated board or salvaged printed-circuit board, wiring the ICs as a socketed subassembly and then securing the "porch" board to the ground plane with hot-melt adhesive. If your design consists mostly of DIP components, build the circuit on perfboard and tack on discrete parts via MSM pads.

If you experiment with nontraditional circuit substrates (e.g., cardboard or unused ashtrays), consider the substrate's mechanical and electrical properties. While an MSM pad and its glue provide a margin of insulation, wood, paper and cardboard lose mechanical strength and can become conductive when wet, causing electrical sneak paths.

Glass and plastic substrates offer superior insulation but require careful handling and mechanical mounting. In general, remove dirt, grease and corrosion products from surfaces before applying hot-melt glues. Otherwise, MSM pads may separate from the substrate due to poor glue bonding.

You can use a transparent plastic box with a removable lid as an enclosure for an MSM circuit by building the layout on the box's lid. However, the plastic may soften beneath each MSM pad, so apply minimum soldering heat for best results.

If you're uncertain about selecting a particular combination of substrate and hot-melt glue, conduct a pull test by attaching an MSM pad to the substrate and soldering a

Satellite City. . .
Now
Radio City Inc.

Check Us Out
- Warranty Service
- $4.90 Two Day Delivery *
- Credit Cards Accepted
- Extended Hours

$4.90*
* in Continental USA
* under 12 lbs.

Discover

1-800-426-2891

KENWOOD

Holiday Special TH-78A

TS-950S/SDX DIx Xcvr w/DVS	2799.95 Call $
TS-850S 9[illegible]	1799.95 Call $
TS-[illegible]S/AT	Call $
TS-790A[illegible]	Call $
TS-690S 10[illegible]	Call $
TS-450S	Call $
TS-[illegible]	Call $
TS-140S	Call $
TR-751A 2[illegible]	Call $
TM-941A 50/[illegible]	Call $
TM-741A[illegible]	Call $
TM-[illegible]	Call $
TM-241A[illegible]	Call $
TM-441A 2[illegible]	Call $
TM-541A 10W	Call $
TL-922A[illegible]	Call $
TH-[illegible]	Call $
TH-28A 2.5[illegible]	Call $
TH-48A 2W 440 [illegible]	Call $
TH-78A 2.5[illegible]	399.95 Call $
R-5000 100KHz-30 MHz	1099.95 Call $
R-2000 150 KHz-30 MHz	799.95 Call $
RZ-1 500KHz-905 MHz Rcvr	599.95 Call $

YAESU

Holiday Special FT-2400H

	MSRP	
FT-1000D 2[illegible] 160-[illegible]m, tu[illegible]	3799.00	Call $
FT-990 160-10[illegible]	2[illegible]	Call $
FT-767[illegible]	[illegible]	Call $
FT-[illegible]	[illegible]	Call $
FT-747 DX [illegible]	[illegible]	Call $
FL-7000 10[illegible]	[illegible]	Call $
FT-736R 2m[illegible]	[illegible]	Call $
FT-650 24/2[illegible]	[illegible]	Call $
FT-[illegible]	[illegible]	Call $
FT-690 All M[illegible]	[illegible]	Call $
FT-790 70 cm[illegible]	[illegible]	Call $
FT-[illegible]	[illegible]	Call $
FT-5200 440 FM[illegible]	[illegible]	Call $
FT-5100 DL-BNQ-[illegible] w/[illegible] m[illegible]	729.00	Call $
FT-2400 50w 2m, FM X[illegible] w/TTP	439.00	Call $
FT-2200 45w, 2m, FM, mic&encode	449.00	Call $

ICOM

Holiday IC-3230A

	MSRP	
IC-7[illegible]	[illegible]	Call $
IC-7[illegible]	[illegible]	Call $
IC-737 N[illegible]	[illegible]	Call $
IC-7[illegible]	[illegible]	Call $
IC-7[illegible]	[illegible]	Call $
IC-R7000 2[illegible]	[illegible]	Call $

Complete Library including::
ARRL • RSGB • ARTSCI • W5YI

Radio City inc.
1-800-426-2891
METRO: (612) 786-4475
FAX: (612) 786-6513
2663 County Rd. I
Mounds View, MN 55112

NOW CANADA

CIRCLE 153 ON READER SERVICE CARD

1/4 watt resistor to the pad. Allow two minutes for the glue to bond. Secure the substrate in a vise.

Using pliers to grasp the resistor's unsoldered lead, apply a steady pull at a 45-degree angle with respect to the substrate. If the glue bond fails before the resistor fractures or the soldered connection peels, choose another glue or substrate.

When assembling an MSM breadboard, remember that bends in a component's leads help alleviate mechanical stress induced by soldering heat. Also, raising a component's body above the substrate improves heat dissipation and provides clearance for cross-under wiring.

Depending upon formulation, hot-melt glues soften at temperatures ranging from 70 to 163 degrees Celsius. Therefore, avoid designs that heat the substrate or dissipate large amounts of power into MSM pads via component leads. Provide longer component leads for extra cooling.

Assembly Ideas

As an alternative to a paper punch, you can use sheet-metal snips or even heavy-duty scissors to cut rectangular pads and bus strips. However, circular pads are free of sharp corners which can cause short circuits.

Lightweight copper-clad material forms easily-assembled shielding partitions and enclosures. Use EMI-suppression conductive adhesive-backed copper tape to form corners of shields and for seam coverage. For permanent tape-to-substrate bonds, tack-solder the tape and substrate at 1/4" intervals.

If you're modifying or repairing a conventional printed-circuit board, use MSM pads as tie points for discrete components. While it's preferable to secure MSM pads to an area of ground plane, in most cases you can also cover signal traces with pads. Trace-to-pad capacitance will amount to only a fraction of a picofarad per pad, and stray signal coupling shouldn't present problems.

Drawbacks to MSM technology include a tendency for reheated pads to slide on a glue "bearing." Use a scribe or soldering aid tool to hold a recalcitrant pad in place. Also, after repeated soldering and unsoldering, a pad's glue bond may weaken, forcing you to replace or reglue the pad.

Hardware built with MSM breadboards tends to spread in two directions, forming shallow layouts that are great for troubleshooting but somewhat hard to package for some applications.

While the author has used MSM technology for several months, MSM remains an experimental assembly method—long-term effects of storage, shock and vibration resistance, and repeated thermal cycling remain unexplored. In the tradition of amateur radio experimentation, the author releases MSM technology to the public domain. Your comments are invited.

NOTE: To obtain a 3" by 5" sample of 12-mil single-sided copper-clad laminate for experimental MSM pad fabrication, send a check or money order for $4 (U.S.) postage and handling to: Brad Thompson N1JIJ, 100 Powdermill Rd., M/S BX-233, Acton MA 01720. 73

Hot-Melts for Hams

If your workshop includes an electric glue gun, chances are you're already familiar with the varieties and brands of hot-melt adhesives typically stocked by hardware stores. If not, here's a review of what's available.

Hot-melt glues come in three varieties. Polypropylene adhesives are yellowish white in color and slightly translucent. Ethylene vinyl acetate (EVA) glues are colorless and translucent. Polyamide glues are opaque and dark amber in color.

You'll find all three types in 1/2" or 1/4" diameter sticks of various lengths. You'll also find hot-melt sealants and caulking compounds—avoid these, as they don't adhere adequately for MSM applications.

In exploratory pull tests, all three types of hot-melt glues provided strong bonds—typically, components' bodies fractured before either solder or glue bonds ruptured. However, pads secured with white sealer/caulking compound failed during a moderate pull, well before component failure occurred.

Peel strength of copper on G-10 or FR-4 board stock is approximately eight pounds per inch of width. Various hot-melt adhesives offer peel strengths ranging from 13 to 45 pounds per inch of width, and thus an MSM pad's foil-to-Fiberglas bond will fail before the actual glue bond between pad and ground plane fails.

A $0.25 single glue stick yields hundreds or thousands of connections, and a carton of sticks probably represents a lifetime supply for most amateurs. However, hot-melt adhesives offer all kinds of interesting possibilities and chances are, you'll use more than you expect.

Beyond MSM assembly, hot-melt glues offer additional applications for amateur radio. For example, you can tack wires in place, secure heavy or bulky components to a substrate, and mount subassemblies in cabinets. However, hobbyist-grade glue guns typically provide poor control of glue flow and produce unwanted stray filaments of glue.

Use a clean soldering iron operating at reduced voltage via a variable-AC transformer to daub beads of melted glue stick where needed. Hot glue adheres to everything (fingers included) and can cause burns, so wear gloves and use caution when applying the glue. Periodically wipe the iron's tip on a damp sponge to remove overcooked glue residue.

When applying hot-melt glue to large metal objects, note that the metal acts as a heat sink and may weaken glue bonds. Warm the metal beforehand for best adhesion.

CABLE T.V. CONVERTERS

Jerrold™, Oak, Scientific Atlantic, Zenith, & many others. "New" MTS stereo add-on: mute & volume. Ideal for 400 & 450 owners.

1-800-826-7623

B & B INC.

3584 Kennebec, Eagan MN 55122

CIRCLE 21 ON READER SERVICE CARD

THE **SOTRON**

COMPACT ANTENNAS FROM 160-10 METERS

NO TUNERS
NO RADIALS
NO RESISTORS
NO COMPROMISE

FIVE EXCELLENT REVIEWS JUST DON'T HAPPEN BY CHANCE
CALL US FOR A FREE CATALOG.

*See review in Oct. 73, 1984 *Sept. 73, 1985 March 73, 1986
CQ, Dec. 1988 Mar. W.R. 91

BILAL COMPANY
137 Manchester Drive
Florissant, Colorado 80816
(719) 687-0650

CIRCLE 42 ON READER SERVICE CARD

NEW ONLINE CALL DIRECTORY

Our new *HAMCALL* service gives you 494,114+ Hams, via your computer. $29.95 per year — unlimited use!

BUCKMASTER PUBLISHING
Route 4, Box 1630 Mineral, VA 23117
703: 894-5777 800: 282-5628

CIRCLE 7 ON READER SERVICE CARD

★★★★ PRESENTING ★★★★

CABLE TV DESCRAMBLERS

★★★★★ STARRING ★★★★★

JERROLD, HAMLIN, OAK
AND OTHER FAMOUS MANUFACTURERS

- FINEST WARRANTY PROGRAM AVAILABLE
- LOWEST RETAIL / WHOLESALE PRICES IN U.S.
- ORDERS SHIPPED FROM STOCK WITHIN 24 HRS.
- ALL MAJOR CREDIT CARDS ACCEPTED

FOR FREE CATALOG, ORDERS & INFORMATION **1-800-345-8927**

PACIFIC CABLE CO., INC.
7325 1/2 Reseda Blvd., Dept. 1870
Reseda, CA 91335

CIRCLE 178 ON READER SERVICE CARD

Actual Circuit Emulation

A better way than ICE!

- More power with much less cost
- Drivers for LCD,DTMF,more
- External power supply for 24 hour a day operation
- Runs independently of PC
- Versatile Interface Adapter on eBoard, simple expansion
- Board resident Forth option
- Use as programmable PCcard
- All source is included. Kernal, Forth. PC Debugger and Assembler
- Cable, Breadboard, Power supply

The eBoard™

Power Supply not shown

$195.95

This is a limited time price for the 6502, 6522 version. Includes shipping and handling

Highlands Electronics
13720 LakeShore Drive
ClearLake, CA 95423
Phone 707 994-1024
Fax 707 994-5823

Object Oriented Hardware™

$489!!
2M/440

DR-592T DUAL BAND MOBILE

45 Watts/2M (Rx 137-173/Tx 144-148), 35 Watts/440 (Rx 410-470/Tx 440-450). Head can be remoted up to 16 feet from radio with optional EDC-20. Cross-Band Repeater, can be turned on and off remotely, frequencies can be changed, all from your HT (DR-592T requires EJ-8U for HT Remote Control). 30 Memories + 10 additional automatic repeater memories + 2 call channels.Tone Encode, remote control/DTMF encode microphone included.

Options: EJ8U DTMF Decoder $43.95 EJ7-U Tone Squelch $62.95
EDC-19 9-Ft Remote Kit $36.95 EDC-20 16=Ft Remote Kit $39.95

$295!!
2M/440 HT

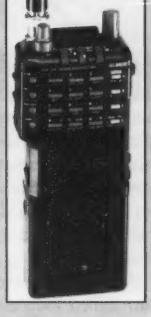
DJ-560T Dual Band HT

2M (Rx 130-174/Tx 144-148). 440 (Rx 400-520/Tx 440-450). 40 Memories + 2 call channels.Tone Encode and Decode.DTMF Encode and Decode. Paging & Scanning Functions. Auto Power Off

DJ-162TD 2 Meter HT

2M (Rx 137-174/Tx 144-148). 20 Memories + Call channel. DTMF Encode and Decode.Tone Encode (Decode W/EJ6U). Paging functions, Scanning, etc. Comes with AA Cell Battery case, see below for Nicad Packs/Chargers

$195
2MHT



Optional Battery Packs for DJ-560 & DJ162-TD
EBP-10N 7.2V x700MAH Only $25.00!!

EBP-10NA/12NA can be used with the EDC37 Smart Charger or wall chargers
EBP-10NA 7.2V x 700MAH only $45.95 EBP-12NA 12V x 700MAH only $59.95
EDC-17 charger for EBP-10N/NA or EDC-18 wall charger for EBP-12A $15.95

These are some of the best deals of all time, where can you find a brand new 2M/440 Mobile for under $500.00 with all theses features, Dual Band HT for under $300, or 2 Meter HT for under $200?

To order, send check or money order with $8.50 for shipping, along with your shipping address (sorry no U.S. Post Office Boxes, UPS will not deliver) and Telephone number to:

Joe Brancato
THE HAM CONTACT
PO Box 3624, Dept 73
Long Beach, CA 90803

CA Residents Add 8 1/4% Sales Tax. Canadian Residents please send U.S. Money Order + $17.10 for shipping.

If you wish more information please send a SASE to the above address. For COD orders, call (310)433-5860, outside of CA call (800)933-HAM4 and leave a message.

Serving The LORD Since 1987

CIRCLE 384 ON READER SERVICE CARD

$40 Special To Charge You Up...

Periphex Power Packs for Longer QSO Time

replacements for	regular price
FNB-12 YAESU 600ma	$ 54.50
BP-84S ICOM 1400ma	$ 63.00
PB-13S KENWOOD 1200ma	$ 49.75
EBP-24S ALINCO 1500ma	$ 62.00

Now Only $40 Each

- One Year Warranty
- Matched cell construction
- Case re-build service
- Long life, extended operating time
- Made for HAMS, by HAMS

Buy your radio from the manufacturer. Buy the battery pack from Periphex— where batteries are our only business!

Add $4.00 Shipping & Handling for first battery. $1.00 for each add'l battery - U.S. only
Connecticut residents add 6% tax.

Available from your dealer...

PERIPHEX inc.

the only thing low about our charge is the cost...

1-800-634-8132

115-1B Hurley Road • Oxford, CT 06478 • (203) 264-3985 • FAX (203) 262-6943

CIRCLE 68 ON READER SERVICE CARD

Maxi-Loop 80

Here's a tried-and-true indoor favorite you can build.

by Richard Q. Marris G2BZQ

Those of us who frequent the lower HF bands (80 and 160 meters) know that sometimes the signal we want can sink into the ambient noise and disappear. This applies to both amateurs and shortwave listeners. The noise in question appears to be an amalgam of a number of sources—some radiated, some atmospheric, and some man-made.

Many hams resort to the use of a multiturn tuned loop antenna for reception. Unfortunately, many are then disappointed with the resulting lower signal strength. Still, the loop's directional properties can reduce some of the noise. So, a preamplifier is inevitably used between the loop and the receiver. This increases signal strength, but also amplifies the noise.

Such lower HF loops are usually capacitor-tuned multi-turn affairs, with a single coupling turn. The loop's wire turns are spaced close together or are even touching.

The loop receiving antenna has been with us since the first days of wireless. It is usually seen in the form of a small-space domestic antenna. It is also used for direction finding (DF), especially in ships fitted with earlier radio telegraphy equipment. I know, because I collect old wireless books and I often used physically small-size MF and lower HF direction finding loops during WWII. Their performance was often impressive.

A review of the literature shook my poor old brain box, producing the realization that these older-type loops were mostly very, very efficient, small in size, and very sensitive. They usually had their multiturns spaced well apart. I also recall that during more recent experiments with multiturn small-dimension transmitting loops, the problem called "proximity effect" had been encountered, usually from the wire turns being too close together. The proximity effect may occur in cases where insulated turns are close-wound (e.g. one wire turn apart). As the turns are brought close to each other, the current density around the circumference of each conductor gets redistributed. The result is a loss in sensitivity or signal strength. For any reader who is interested, the proximity effect is analyzed more deeply in the *ARRL Antenna Book* (16th edition), and in other textbooks.

> ***"The loop receiving antenna has been with us since the first days of wireless."***

I decided to experiment to try and improve the loop's sensitivity (i.e. signal strength) and selectivity (to reduce the ambient noise level and other interference). The experiments compared various turn spacings and various methods of coupling to the receiver. For the initial experiments, a convenient suitable-size cardboard carton was used as a simple frame. A reel of PVC covered hook-up wire and a roll of masking

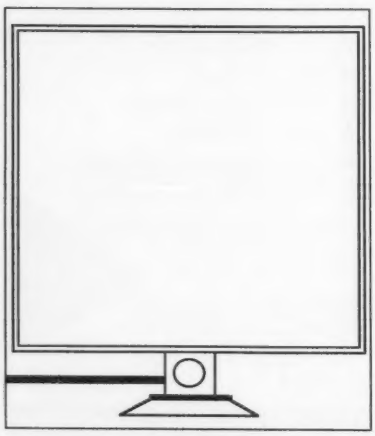


Figure 1. Maxi-Loop 80 antenna profile.

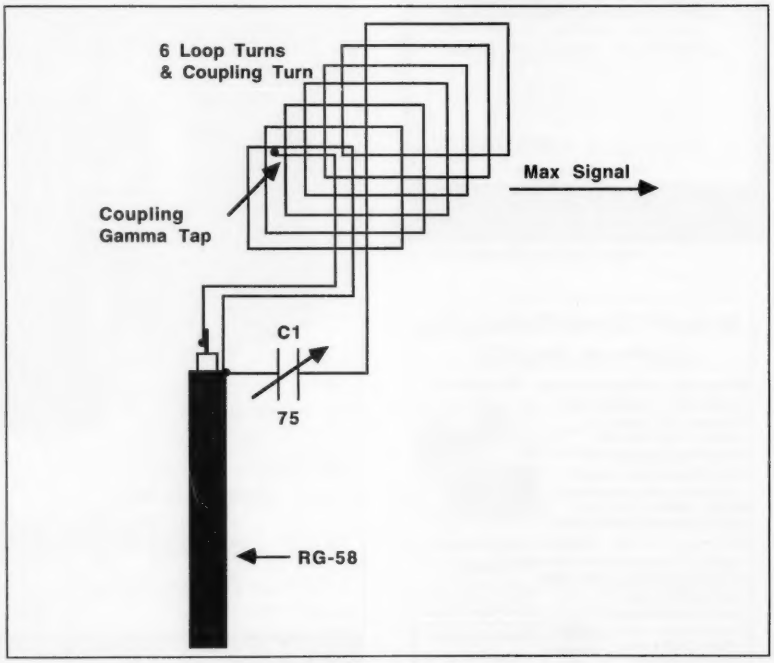


Figure 2. The antenna's electrical circuit.

PacTOR / AMTOR Without a TNC

G4BMK's **BMK-MULTY** software, in addition to unequaled AMTOR performance, now does PacTOR with any ordinary RTTY terminal unit such as CP-1, CP-100, TU-170, ST-6, ST-5000, ST-6000, etc., plus we now have an adapter for PK-232. IBM-PC or compatible required.

Detailed literature upon request. Base version with AMTOR, RTTY, CW and Audio Spectrum Analyzer $95. Base + PacTOR $145. Extended version also includes HF WEFAX and SSTV reception $125. Extended + PacTOR $165. PacTOR alone $50. PK-232 Adapter $49. Shipping $3. VISA/MasterCard accepted.

Amateur callsign required with order.

State 3½ or 5¼ inch disk preference.

Authorized U.S. Distributor:

Schnedler Systems AC4IW

25 Eastwood Rd. • P. O. Box 5964 • Asheville, NC 28813

(704) 274-4646

PC HF FACSIMILE 7.0 $99

Now under Windows or DOS

PC HF Facsimile is a simple, yet comprehensive shortwave fax system for the IBM PC and compatibles. It includes an FSK demodulator, advanced signal processing software, tutorial cassette, and complete reference manual. With your PC and SSB receiver getting FAX is a snap. Here are just some of the features:

- Mouse or Menu Driven
- Unattended Operation
- Easy Tuning Oscilloscope
- Start/Stop Tone Recognition
- Up to 256 Levels
- Single Scan per Line with EMS Memory
- Programmable Colorization
- Brightness and Contrast Control
- Transmit Option Available
- Image Zoom, Scroll, Pan, Rotation
- Grayscale on all Popular Printers
- Worldwide Broadcast Schedule
- Worldwide Frequency Listing
- CGA,HGA,EGA,VGA & Super VGA
- Time Lapse Frame Looping
- Slide Shows
- Programmable IOC & Line Rates
- Image Cropping
- Automatic Radio Control
- NAVTEXT & RTTY Option Available

Call or write for our free catalog of products. Visa & MasterCard welcome.

Software Systems Consulting

615 S. El Camino Real, San Clemente, CA 92672

Tel.(714) 498-5784 Fax.(714) 498-0568

CIRCLE 250 ON READER SERVICE CARD

LOOK WHAT YOU COULD BE MISSING . . .

✓ White/Pink Noise

✓ Power Line Noise

✓ Multiple Heterodynes

NIR-10 Noise/Interference Reduction Unit

Only $349.95

	Also Available:	
	NRF-7 General Purpose Noise Remover and Filter	$249.95
NEW	**NRT-1** SWL Wide Band Audio Noise Reducer	$169.95
	NF-60 Notch Filter	$149.95
	115 VAC to 12 VDC Adaptor	$ 16.00

The NIR-10 Noise Reduction Unit gives you REAL effective reduction of band noise, power line noise, ignition noise, computer noise, steady static, etc. from your received audio WITHOUT REDUCING THE AUDIO BANDWIDTH! Listening on the ham bands is pleasurable through the reduction of noise and interference. New software version 3.0 offers enhanced notch performance and a peaking function to improve the white noise reduction without "surging".

TOLL FREE ORDER LINE

800-533-3819

We accept MC, VISA, checks, Money Orders

Shipping free in Continental U.S. $4.50 for COD

JPS Communications Inc.

P.O. Box 97757, Raleigh, NC 27624

Technical Line (919) 790-1048 FAX (919) 790-1456

"First and Finest in Noise Reduction Products"

CIRCLE 285 ON READER SERVICE CARD

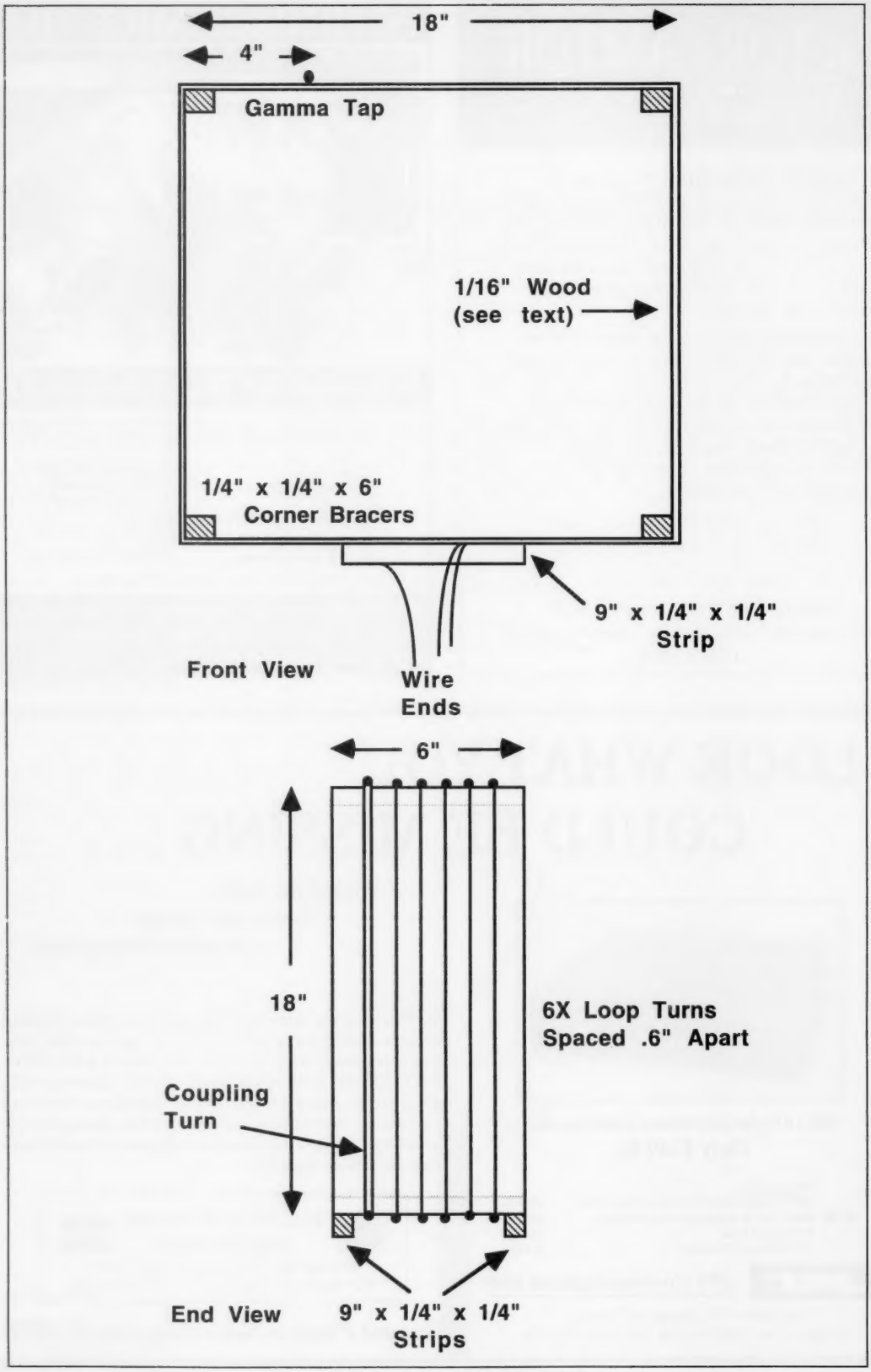


Figure 3. The Maxi-Loop 80's frame and winding.

THE ADVANTAGES OF BUYING AZDEN

No matter what your frequency requirements (2, 6, 10, 220, 440), when you buy a mono-bander factory-direct from Azden, you'll enjoy these five great advantages:

POWER: Handhelds-5 watts, Mobiles- 50 watts, (25w on 220MHz, and 35w on 440MHz.) Standard!

FACTORY-DIRECT SERVICE AND TECHNICAL SUPPORT: Factory engineers and technicians perform all service, and our sales staff are hams, with years of experience.

RELIABILITY: All Azden radios are heavy-duty commercial grade (designed to MIL-STD-810),and are virtually "maintenance free".

FLEXIBILITY: We go the extra step, like CAP and MARS mods at no charge, with proper documentation.

TWO YEAR WARRANTY: The only manufacturer confident enough to offer this, everything is covered for the first year, and we only charge for labor in the second year.

MOBILES	
PCS-7000H	2 Meters
PCS-7200	220 MHz
PCS-7300H	440 MHz
PCS-7500H	6 Meters
PCS-7800H	10 Meters
HANDHELDS	
AZ-11	10 Meters
AZ-61	6 Meters
AZ-21A	2 Meters
HEADPHONES	
HS-03	With Boom Mic
DM-10	Without Mic

So whether you're buying a mobile, handheld radio or communications headset, come to Azden. We understand.

AZDEN®
COMMUNICATIONS DIVISION

TO PLACE CREDIT CARD ORDERS (ONLY) CALL 1-800-645-7656

For literature, prices, and service call (516) 328-7501, Fax: (516) 328-7506, or write to:
AZDEN CORPORATION, 147 New Hyde Park Road, Franklin Square, New York 11010.

MasterCard VISA

CIRCLE 92 ON READER SERVICE CARD

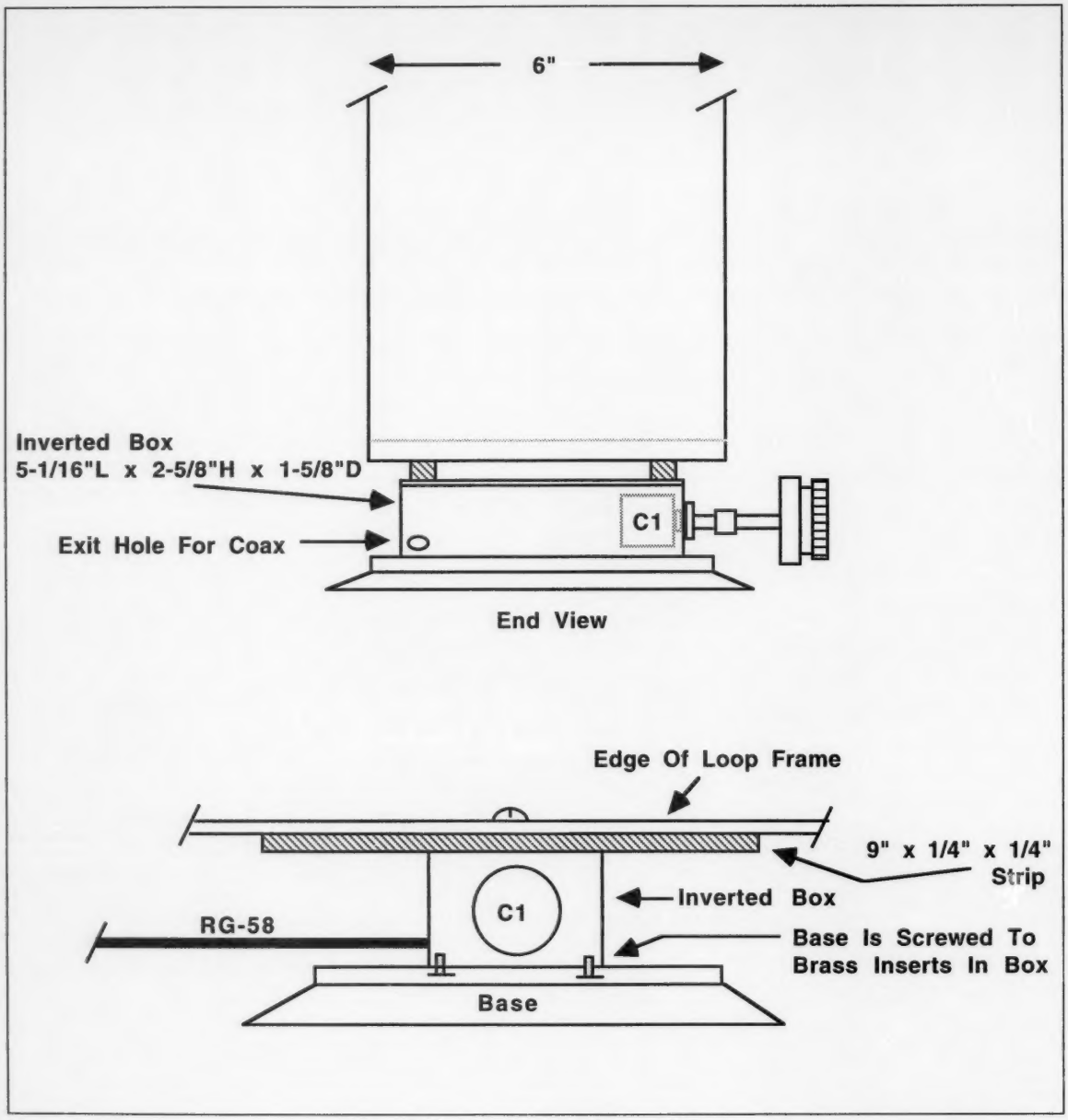


Figure 4. Mounting the antenna frame on the box.

tape held things in place and allowed for quick alterations. After several hours' work, using a frequency around 3.5 MHz, I wrote down a loop specification:

1. To be usable indoors, the loop must be small, lightweight, and decent to look at.

2. The goal is maximum sensitivity (i.e. greatest signal strength) with maximum selectivity.

3. A minimum of 1/8 wavelength of wire would be necessary, as performance falls off when proceeding with much less.

4. The estimated size was 18" x 18" x 6" using six wire turns spaced at 0.6" apart, from conductor center to conductor center.

5. A form of gamma match coupling would be used in preference to the usual loop coupling turn.

6. To obtain the absolute best results the loop would be an 80 meter band monobander.

Design Description

The resulting loop profile is shown in Figure 1. The loop frame is neatly pivoted on the flared base with a small plastic box, which encloses the resonating variable capacitor and sundry wiring.

The circuit, Figure 2, shows a six-turn loop resonated by a 75 pF variable capacitor. The coupling to the receiver is a form of "gamma" match which, in the original cardboard carton experiments, was proved to provide better sensitivity than the more typical coupling turn. The frequency range is 3000-5000 kHz, with excellent sensitivity. Note: If C1 is replaced with a 200 pF variable capacitor, this will give a frequency range of 1750-5000 kHz, with performance falling off somewhat below 2500 kHz but still usable. A slow-motion drive would then be required with C1 = 200 pF.

The resulting performance, throughout the 80 meter (3.5 MHz) band was lively, with a high degree of signal strength and good selectivity reducing the ambient noise level substantially. A preamplifier was not necessary with a good superhet communi-

- Packet Radio -
Portable & Affordable!

Model BP-1
Packet Modem
Made in U.S.A.

★ Simple Installation
★ No External Power
★ Smart Dog™ Timer
★ Perfect For Portable
★ Assembled & Tested
★ VHF, UHF, HF (10M)

Whether you're an experienced packeteer or a newcomer wanting to explore packet for the first time, this is what you've been waiting for! Thanks to a breakthrough in digital signal processing, we have developed a tiny, full-featured, packet modem at an unprecedented low price. The BayPac Model BP-1 transforms your PC-compatible computer into a powerful Packet TNC, capable of supporting sophisticated features like digipeating, file transfers, and remote terminal access. **NOW** is the time for **YOU** to join the **PACKET REVOLUTION!**

Just...
$49.95
+Shipping

Tigertronics Incorporated
400 Daily Lane
P.O. Box 5210
Grants Pass, OR
97527

1-800-8BAYPAC
1-800-822-9722
(503) 474-6700

CIRCLE 269 ON READER SERVICE CARD

INTRODUCING THE UNIVERSAL M-400
A totally new concept in code / tone readers!

- Baudot
- Sitor A/B
- ASCII
- Swed-ARQ
- FEC-A
- FAX
- POCSAG
- GOLAY
- ACARS
- DTMF
- CTCSS (PL)
- DCS (DPL)

- **A RTTY-reader *and* tone-decoder in one!**
- **Easy to read two-line 40 character LCD.**
- **No computer or monitor required.**

Forget the limitations you have come to expect from most "readers". The self-contained Universal M-400 is a sophisticated decoder *and* tone reader offering an exceptional range of capabilities. The SWL will be able to decode Baudot, SITOR A & B, FEC-A, ASCII and SWED-ARQ. Weather FAX can also be decoded to the printer port. The VHF-UHF listener will be able to copy the ACARS VHF aviation teletype mode plus GOLAY and POCSAG digital pager modes. Off-the-air decoding of DTMF, CTCSS (PL) and DCS is also supported. The M-400 can even be programmed to pass only the audio you want to hear based on CTCSS, DCS or DTMF codes of your choosing. The M-400 can run from 12 VDC or with the supplied wall adapter. The American-made Universal M-400 is *the* affordable accessory for every short-wave or scanner enthusiast. **Only $399.95** (+$6 UPS).

Universal Radio
6830 Americana Pkwy.
Reynoldsburg, OH 43068
◆ Orders: 800 431-3939
◆ Info: 614 866-4267

FREE CATALOG
This huge 100 page catalog covers everything for the shortwave, amateur and scanner enthusiasts.
Request it today!

The ears have it!

"The R8 is like a breath of fresh air, with its ground-up engineering and up-to-date digital control from the front panel. I am very pleased to see a quality HF receiver of American manufacture that should successfully compete on the world market."

Bill Clarke
73 Amateur Radio Today

When we introduced the American-made R8 Worldband Communications Receiver, we knew it would be judged by some very discerning ears, experts accustomed to the finest in short-wave listening equipment from around the world. After listening to the world on the Drake R8 loud and clear, they have delivered a decisive verdict.

They appreciated the R8's sensitivity, clarity, simplicity, and all-around versatility so much that many of them declared the R8 simply the best of its class. High praise, indeed, from very well-traveled ears.

But why take the word of mere experts? Put the Drake R8 to the test yourself with a 15-day money-back trial period on factory direct purchases, and let your ears be the judge. If you're not impressed by Drake's quality, performance and ease of operation, all in a receiver costing less than $1,000.00, return the R8 Receiver within 15 days, and we'll refund your money in full, less our original shipping charge. To order your R8 factory direct, for more information, or for the dealer nearest you, call **1-800-723-4639** today. We're confident that once you've listened to the R8, your ears will hear of nothing else.

R.L. Drake Company
P.O. Box 3006
Miamisburg, OH 45343
U.S.A.

DRAKE
In touch with the world.

CIRCLE 147 ON READER SERVICE CARD

cations receiver, and this is with the loop on a table indoors alongside the operating position. However, it must be remembered that the results from such a loop may vary from location to location and operator to operator.

Construction

The lightweight box-style mainframe is shown in Figure 3. It consists of four obeche wood panels 18" x 6" x 1/16". (Obeche appears to be similar to balsa wood, but stronger.) Of course, 1/16" ply, or other wood, could be used, with an increase in weight.

The four panels 18" x 6" are corner-glued together, with 1/4" x 1/4" molded wood corner bracers, as shown in Figure 3. Two 9" x 1/4" x 1/4" mounting/bracing strips are glued at the bottom, as shown in Figure 3.

Onto the frame wind six counter-clockwise turns of PVC-covered single-conductor 0.6 mm-diameter hookup wire, with the turns spaced at 0.6" apart from conductor center to conductor center. The same wire is used for the gamma match coupling turn, which is tapped onto the main winding 4" from the top left-hand corner (Figure 3) of the first turn. It is run alongside the first loop turn and touching it as shown in the circuit. The turn's ends (about 3") are secured by running them through small holes drilled in the 9" x 1/4" x 1/4" bracing/mounting strips, and they can be pruned back later during wiring. To keep the turns exactly 0.6" apart, a blob of glue should be placed on them at the frame corners. Note: After initial tests, the loop frame (and turns) should be varnished outside and inside with polyurethane varnish. This makes the somewhat flimsy loop frame/winding (Figure 3) quite rigid.

Figure 4 shows the plastic box (5-1/16" x 2-5/8" x 1-5/8"), which has a thin metal lid fastened with four corner screws into brass threaded corner inserts. The metal lid is not used.

First, C1 is mounted in the box end center, as shown, and the mainframe loop is secured to the box with two screws with washers and nuts (Figure 4). The two screws pass through the 9" x 1/4" x 1/4" bracing strips, and the inverted plastic box.

Using the discarded metal box top as a drilling jig, drill four holes through the flared mounting base, which is a rigid, colored plastic picnic plate, which loses its original identity when inverted and screwed to the box.

The RG59 coaxial feedline to the receiver is brought through a hole in the side of the plastic box, as shown, and is 48" long. It is cleated to the inside of the box.

After completing the simple wiring inside the box, the inverted plastic plate is screwed to the box.

Testing and Operation

After plugging the coaxial feedline into the receiver, which is tuned to 3500 kHz, C1 is rotated to resonance. This is repeated at 3800 kHz (4000 kHz in the U.S.A. and some other countries). There should be a frequency overlap at either end of the 80 meter band. The prototype tuned from approximately 3000 to 5000 kHz.

Tuning to various stations over the 3.5 MHz band, you should find that there is very adequate signal strength, with excellent selectivity and low ambient noise. The directivity of the loop is the usual figure-eight polar diagram, with maximum signal off the ends, and minimum on the flat side of the loop. However, due to the coupling method employed, one lobe is larger than the other. Though the purist may shudder at this, it is an advantage as it reduces other unwanted stations' interference on the reciprocal bearing (i.e. 180 degrees), and is a quite deliberate feature of the design. I haven't needed a preamplifier as there is quite adequate signal strength with the loop indoors at this location in a built-up area. The loop should be kept well clear of the room walls and metal objects and wiring and pipes, etc.

Using a 2 watt QRP transmitter as an experiment, it was possible to load up the loop. However, with those thin loop wire conductor turns, it is unlikely that the transmitted results would be very acceptable.

"It is absolutely essential that the loop is deactivated on transmit, otherwise the whole transmitted power will arrive at the receiver input, with quite devastating results."

Though the construction is very simple, it must be followed as closely as possible as the design has been targeted at the 80 meter band only, and I've been somewhat amazed how critical the turn spacing appears to be to get maximum signal strength.

The transmitting amateur will obviously be using the loop with a receiver, and the main antenna on the transmitter. It is absolutely essential that *the loop is deactivated on transmit*, otherwise the whole transmitted power will arrive at the receiver input, with quite devastating results. The method that I adopted is to "short" the RG58 loop feedline at the point where it enters the receiver. This can be done with a manual switch, relay, or RF-operated device. Whatever the method adopted, it should be tried with great care at low power and then at gradually increased power. 73

References

The following are some of the textbooks used for reference. The first two are readily available, whereas the others are collector's items. Such older textbooks should not be scorned, as the conclusion that I've reached is that some of the older loop designs were probably superior to many of the present-day designs. Such books can often be found at flea markets, etc.

1. *Antennas* by J. Kraus.
2. *The ARRL Antenna Book*, 16th edition.
3. *The Admiralty Handbook of Wireless Telegraphy*, 1938.
4. *The Radio Designers Handbook*, 1953, by Langford-Smith.
5. *The Handbook of Technical Instruction for Wireless Telegraphists*, 1942, by H.M. Dowsett and L.E.Q. Wallen.
6. *Radio Techniques*, by A.G. Mills, 1943/44.
7. *Outline of Wireless*, by L.B. Turner, 1921.
8. *Measurements in Radio Engineering*, by F.E. Therman, 1935.

Parts List

1	Box	5-1/16" x 2-5/8" x 1-5/8"	Tandy/Radio Shack 270-233
1	Variable capacitor(C1)	75 pF	Jackson C809 or C802, or similar small ceramic variable capacitor
4	Obeche	18" x 6" x 1/16"	Or alternatives—see text
1	Length moulded wood	1/4" x 1/4"	
1	RG58 coaxial feedline with suitable coaxial plug	48"	
1	Baseplate (see text)		
1	Knob and extension shaft for C1		
1	50-foot reel of PVC-covered single-strand wire		0.6 mm conductor

JRC

JRL-2000F

Fully Automatic MOSFET HF LINEAR AMPLIFIER

- 1 kW No-Tune Power Amplifier
- 48 MOSFETs Single Ended Push-Pull (SEPP) Design
- Built-In Automatic Antenna Tuner
- High-Efficiency Switching Power Supply

The JRL-2000F is the world's first MOSFET HF linear amplifier, designed using the same high technology found in JRC's professional high-power radio transmitters. Featuring a heavy-duty power amp that incorporates 48 RF power MOSFETs to ensure low distortion and clean output up to 1,000 watts (100% duty cycle, 24 hour) SSB/CW, plus a high-speed automatic antenna tuner with memory capacity of 1820 channels for instant QSY. Plus a high efficiency switching power supply (80V-264V) with power factor correction to supress AC line currents, an automatic antenna selector for up to four antennas and a wireless remote control unit.

JRC Japan Radio Co., Ltd.

430 Park Ave, 2nd Floor New York. NY 10022
Phone : (212)355-1180 Fax : (212)319-5227
Telex : 961114 JAPAN RADIO NYK

CIRCLE 159 ON READER SERVICE CARD

Number 12 on your Feedback card

HAMSATS

Amateur Radio Via Satellites

Andy MacAllister WA5ZIB
14714 Knights Way Drive
Houston TX 77083

New Satellites in Orbit

A one-day delay due to poor weather conditions was the only snag in the launch of four new satellites carrying amateur radio payloads. Conditions for launch require that wind speeds not exceed 30 mph, horizontal visibility be at least 1,970 feet, and the cloud ceiling be 820 feet or higher.

On September 26, 1993, at 0145 UTC, the 59th rocket of the European consortium Arianespace lifted off from its South American launch pad carrying seven satellites bound for an 800-km-high polar orbit. The sidebar shows the sequence of events following engine ignition. While this launch was the 31st for an Ariane 4 booster, is was only the third time an Ariane 4 had been used without any strap-on boosters and the fourth time for the ASAP (Ariane Structure for Auxiliary Payloads) platform. The ASAP is a donut-shaped mounting plate for small satellites near the base of the main payload.

The Ariane 40 used for V-59 stands 180 feet tall with a lift-off mass of 240,000 kg. It is a three-stage vehicle capable of placing 4,670 pounds of payload into the desired polar orbit. The first stage (L220) is built by Aerospatiale, and is powered by four liquid-fueled Viking V engines. The second stage (L33) is built by MBB Erno, and is powered by a single Viking IV engine. The first and second stages use a biliquid fuel. The third stage (H10) is built by Aerospatiale, and is powered by a cryogenic liquid hydrogen and oxygen fueled HM-7B engine.

Most Ariane launches are for communications satellites destined for geostationary orbits over the equator. The main payload on V-59 was SPOT-3, an earth observation satellite used for earth imaging and mapping. Its mass is almost 10 times that of all the other satellites on the mission.

Of the six small satellites launched, two were based on the microsat design from AMSAT-NA, four were of SSTL (Surrey Satellite Technology Ltd.) design, and one, *Stella*, was a space geodetic satellite from CNES (Centre National d'Etudes Spatiales). Stella was mounted under SPOT-3, inside the payload adapter.

The two microsat-type satellites were ITAMSAT, now known as ITAMSAT-OSCAR-26, and EYESAT-A, now called AMRAD-OSCAR-27. Both were built from designs originally from AMSAT-NA, but with changes and upgrades. IO-26 is dedicated to amateur radio service while AO-27 is primarily for commercial uses and was constructed by Interferometrics, Inc. of Vienna, Virginia.

The three SSTL-style spacecraft include KITSAT-B, now known as KITSAT-OSCAR-25, POSAT-1, which may be named POSAT-OSCAR-28 and HEALTHSAT-1. K-O-25 from SaTReC (Satellite Technology Research Center) of Korea is dedicated to amateur use. PO-28 from LNETI in Portugal is primarily to stimulate space application efforts in Portugal and may be available for some ham operation. HEALTHSAT-1 from SSTL is to be used by medical schools, universities, hospitals and documentation centers in Africa. It carries no equipment for amateur radio use, although its downlink is in the 420-430 MHz band. In Europe this is not a ham band.

The first signals heard from the new hamsats were those of AO-27 on 436.8 MHz. Within a day all of the satellites had been heard and were being loaded with software and successfully commanded by ground stations. The SSTL craft carry 16.5-foot-long gravity gradient booms that are deployed after all tumbling motion has been dampened by on-board computer control. PO-28 and HEALTHSAT-1 were both stabilized within a few days. Boom deployment was accomplished first on PO-28 and later on HEALTHSAT-1 by SSTL. Control of KO-25 was accomplished from the group in Korea.

Last month's column contained descriptions of the frequency plans for the new hamsats and further data on their operation. While they will provide more digital communications for hams on earth, other onboard experiments like KO-25's color camera will furnish new excitement for those interested in the scientific aspects of amateur radio satellites.

The End of *ARSENE*

On September 25th a group of French ground-control stations for *ARSENE*, the recently launched French hamsat, made a series of attempts to recover control of their satel-

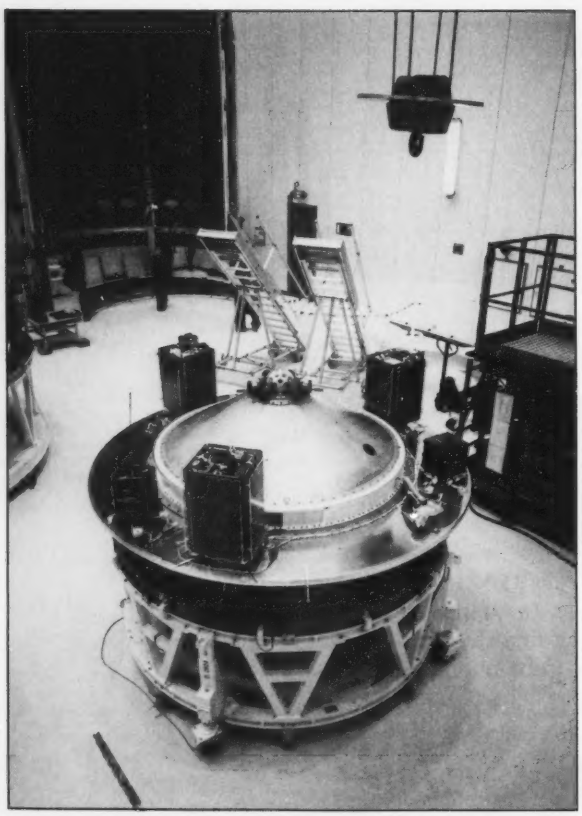


Photo A. Preparing the microsat payloads for the V-59 flight. (Arianespace photo.)

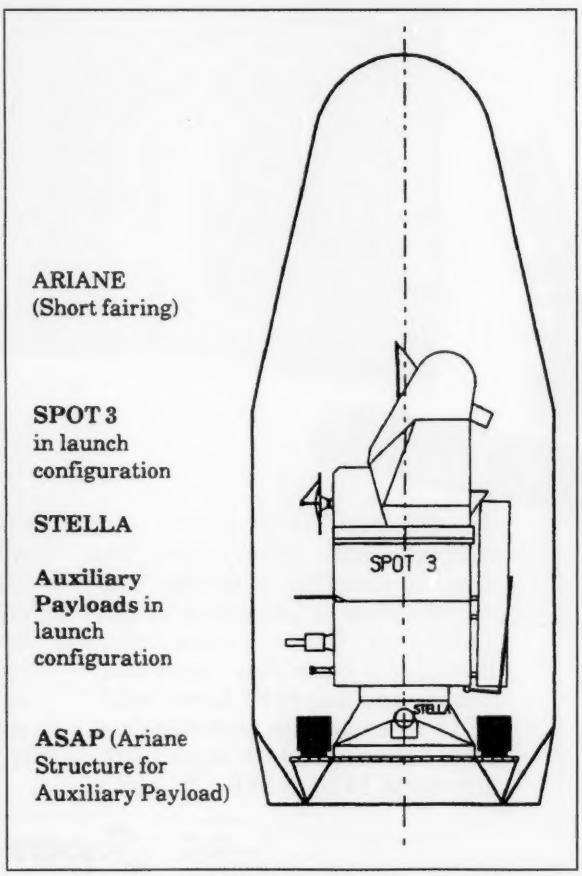


Figure 1. Ariane payload flight configuration. (Arianespace drawing.)

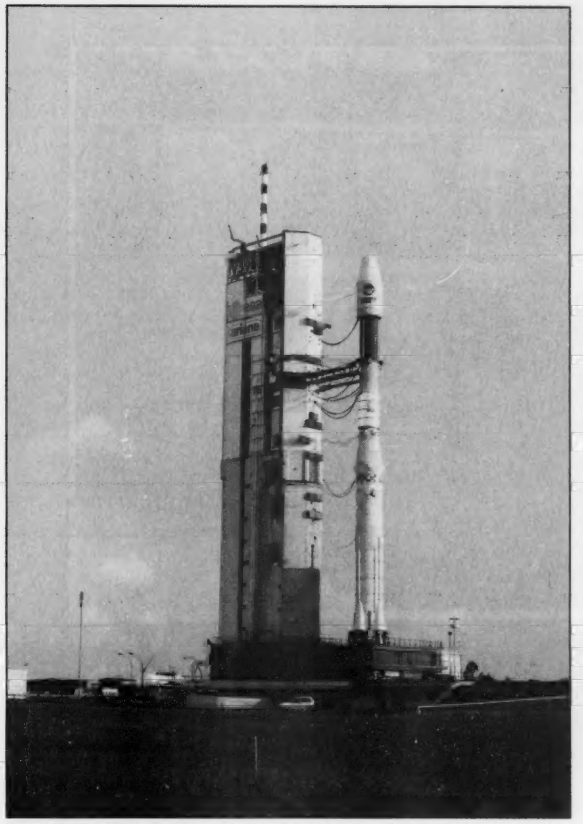


Photo B. The ARIANE 40 launch vehicle (without strap-on boosters) into preparation on its table before liftoff, Kouru, French Guiana, September 25, 1993. (Arianespace photo.)

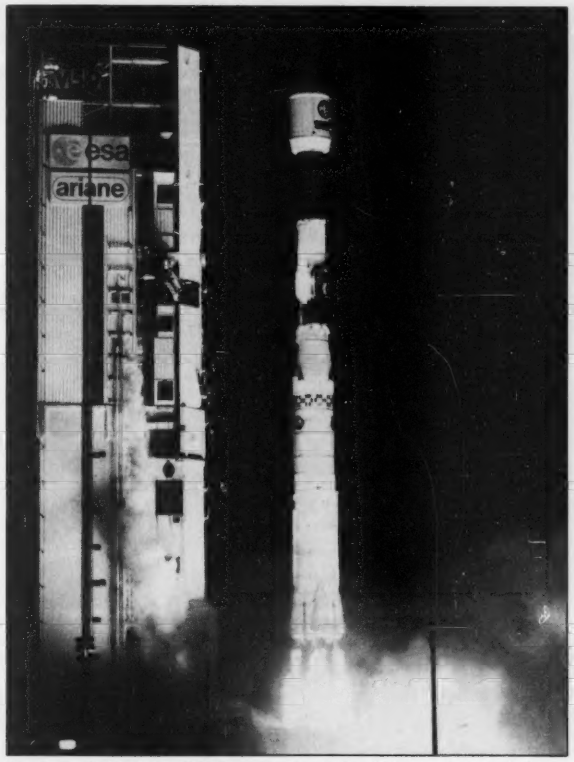


Photo C. Liftoff of the ARIANE 40 launcher (without strap-on boosters), Kouru, French Guiana, September 25, 1993. (Arianespace photo.)

lite. Since launch, *ARSENE* has had problems. The 2 meter transmitter did not function and commands to the satellite were not always executed.

The F5ELL UHF moonbounce station was used to send a long series of telecommands on 70cm to *ARSENE*. The F5ELL system includes a 26-foot parabolic dish and 2,000 watts power. F5PL monitored the *ARSENE* downlink on 2.4 GHz with a 23-foot dish. Nothing was heard after several attempts. It is likely that the satellite has experienced a catastrophic failure. Some efforts will be made to regain control, but prospects are not high in France.

Many stations made contacts through the *ARSENE* transponder. It is hoped that the groups responsible for this ambitious satellite will use the experience gained to build another.

73

Flight Profile of V-59

00:00	Ignition
00:04	Liftoff
02:39	First stage separation
03:48	Fairing jettison
04:48	Second stage separation
04:53	Third stage ignition
16:44	Third stage shutdown/orbit injection
17:17	SPOT 3 separation
20:39	STELLA separation
22:56	KITSAT, POSAT, HEALTHSAT separation
24:27	EYESAT, ITAMSAT separation
26:34	Third stage avoidance maneuver
29:00	End of Ariane mission 59

MORSE CODE MUSIC!

SENSATIONAL NEW WAY TO LEARN CODE—Do Aerobics, Sing, Jog, or Drive while learning code! A fun & easy way to learn or retain Morse Code skills. Now the secret is yours with this amazing syncronized breakthrough! Great for Novice, Technician or the classroom. Order:

"THE RHYTHM OF THE CODE"
Version 2 cassette today!

Send $9.95 and we'll pay the shipping to:

KAWA RECORDS
P.O. Box 319-ST
Weymouth, MA 02188

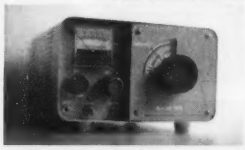
Check or money order only. We ship all orders within 5 days.
Overseas please add $2.00 for air mail.
MA residents add 5% sales tax.

CIRCLE 2 ON READER SERVICE CARD

hambrew

FOR AMATEUR RADIO DESIGNERS AND BUILDERS

Quarterly
$20/yr.



Kitbuilders
Antennas
Telemetry
QRP
Advanced
Basic

Packed With Projects! By Hams For Hams!

NOT SOLD IN STORES

PO Box 260083•Lakewood, CO 80226
VISA•MC: 1-800-5-HAM RIG

★ MADISON SHOPPER ★

ORDERS: 1 (800) 231-3057
1 (713) 729-7300 or 729-8800
FAX 1 (713) 729-4766

New and Used Meters,
Tubes, Transformers,
Filter Capacitors
And More

VISA MasterCard

FREE List Call

Madison Electronics
12310 Zavalla Street
Houston, TX 77085

CIRCLE 25 ON READER SERVICE CARD

Yaesu and Ross Distributing Company Still Going Strong!

PICTURE YOURSELF...

We Have All The Most Wanted YAESU Products

Including These Old Favorites and All The Newest Items and At The Lowest Prices - Like These

AD-37 - DUPLEXER	$44.50
SPR-901 - CATPACK 9600 APPLE II	$23.90
DVS-1 - DIGITAL VOICE MEMORY MODULE	Phone
DVS-2 - DIGITAL VOICE REC. MODULE	Phone
DVS-3 - VOICE MEMORY UNIT (FT-2500,51)	Phone
FBA-1 - BATTERY PACK ASS'Y, CHARGER	$6.90
FC-757AT - AUTOMATIC ANT. TUNER	Phone
FIF-232C - RS-232C INTERFACE W/DS	$101.00
FNB-14 - 7.2V 600MAH NICD SAT	$65.00
FNB-23 - NICD 7.2V, 600MAH (FT-26/76)	$44.90
FP-4A - AMP. POWER SUPPLY	$49.00
FP-700 - AC POWER SUPPLY	$220.00
FP-800 - 20AMP HVDUTY PSET-690	$279.00
FRS-10 - 10CH 2.5CM HZ DCS	Phone
FRP-1 - REMOTE SPK W/ 2W MPAW	$19.90
SP-5 - REMOTE SPEAKER	$28.90
FT-10000D - DDS 160 M ANT TUNER	Phone
FT-23R/1 - 10CH 144 MHZ 5 25/50 W	Phone
FT-26M (1) - FNB12, CSC44, NC28B 2.5	$229.00
FT-4600H - 5M 2M 50 W 31 M CTCSS	Phone
FT-50R - 300KHZ - 56, HT, FNB12, SWRT	$275.00
FT-411E/17 - 2M, DTMF, FNB17,NC28B	Phone
FT-415/26S - 2M, DTMF, CTCSS, EN,DC	Phone
FT-41R/26-S - 10CH 144 MHZ, DTMF,SC	Phone
FT-470 - 2M/70CM 4 VFOS 42 MEMO	$379.00
FT-5100/56 - DUAL REC DTMF 34 MEM	Phone
FT-530/26-S - DUP HT DUP R VOX	Phone
FT-708R - 70CM HT (FNB-43,SC10)	$379.00
FT-726R - 6M/2M/70CM ALL MODE XCVR	$259.90
FT-736R - VHF/UHF ALL MODE XCVR	Phone
FT-738 - 70CM HT (FNB10, NC28B,CC	$265.00
FT-757GXII - 10-80 M 100 W	$629.95
FT-767 - 70CM ALL MODE MOBIL	$567.99
FT-811 - 144M,RX(A),DTMF,20-5 WATT	Phone
FT-840 - DSP 100 W 160-10 CTCSS	Phone
FT-890 - HF MOB 100WAT 1.8-30 MHZ	Phone
FT-911 - 1.8-54 HT WATTS 4 DTMF	Phone
FT-990 - HF XCVR 100 W ALL MODE	Phone
FC-20/45 - 108-185 MHZ	$600.00
FT-2470H - UHF 50CH 2 WATT	$300.00

XF-10HLA - LSB FILTER OPTION	Phone
XF-445C - 500 HZ CW FILTER	$51.90
XF-455CN - 270 HZ CW FILTER	$51.90
XF-6.2GA - 6 KHZ AM FILTER	$39.90
XF-D - FLTR 2.0 KHZ BW NOT AM, FM	$139.95
XF-L - FLTR 500 HZ BW CW, RTY, PKT	$140.00
XF-F - FLTR 250 HZ BW CW, RTTY	$150.00
YF-100 - 455KHZ CW 500HZ XTL FIL	$116.00
YF-101 - 455KHZ SSB 2.8KHZ XTL FIL	$143.50
YF-[illegible] - RTTY (READ)	$469.00

FTS-17 - CTCSS S/TAS/UNIT-FTS	$44.90
FTS-6 - CCTSS FOR FT-727R 2064H	$49.90
FTS-7A - CTCSS/FT-290/690/790RII	$39.90
FTS-8 - CTCSS UNIT/FT-270,2700RH	$54.00
FVS-1 - VOICE SYN./F 270/2700RH	$36.25
FVS-1A - VOICE SYNTHESIZER(FVS1)	$36.25
G-1000SDX - 450SEG.W/PRE.SPED.CL	Phone
G-5400B - AZIMITH ELEVATION ROT.	$450.00
LCC-6 - DEL.CASE 112/31 /43/208,7	$39.50
LCC-7 - 207R LEATHER CASE	$19.90
L-5 - PH.PATCH UNIT/SP-5 SP-6	Phone
MH-18A2B - SP. le OH.MIC. IK.MIN.MC	Phone
MH-19A2B - EARPIECE/MIC.PPT SWITCH	Phone
MH-29A2B - DIR.SPEAKERMIC/FT530	Phone
MMB-32 - MOB.BKT-23,ECT.W.CLIP	$10.00
NC-2 - 4 HR. DESK CHARGER	$49.80
NC-29 - DESKTOP CHG (FNB12S,14,17	Phone
NC-37 - QC DROP IN/47/911/811	Phone
NC-42 - 1HR QS SK RAP CH/FT415/815	Phone
NC-7 - 15 HR. DESK CHARGER	$42.90
NC-9A - STAN./QUICK CHARGR. AC-DC	$50.00
PB-1103 - EXTENDER BOARDS/P14	$12.95
PB-1104 - EXTENDER BOARDS/P18	$14.95
PB-1888 - EXTENDER BOARDS/P20	$6.00
PB-2233 - EXTENDER BOARDS/P36	$22.90
P-40 - 40 PIN EXTENDER BOARDS	$24.85
PA-6 - CC.CAR.ADAPTR RCHG/CIGPLG	$24.50
PA-7 - BATT PACK-EXTENSION CABLE	$30.25
PB-1181A - FT1013 RF UNIT	$30.00
PB-1181B - FT-1013SDF RF UNIT	$29.95
PB-1494 - SPEECH PROCESSOR 101SC	$69.00
PB-1903 -	$30.00
RMK-747 - REMOTE KIT (FT-747GX)	$196.00
SC-1 - STATION CONSOLE CL, PS,	$139.95
TCXO-2 - TEMPERATURE COMP.XTAL(I)	$189.95
XF10.7KC - 8CC HZ IF 3RD IF F	$36.60
XF10.8HC - 600 HZ CW FILT 625	$45.20
XF-455C - 500 HZ CW FILTER	$51.90
XF-109C 500 - HZ CW, CRYSTAL FILT	$117.95
XF-10.9M - 2KD IF 8SS NARROW 2.0	$117.95

Call Today (208) 852-0830

ROSS DISTRIBUTING COMPANY

78 S. State Street, Preston, Id 83263

RDC

CIRCLE 254 ON READER SERVICE CARD

RTTY LOOP

Number 13 on your Feedback card

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

Last month, I hinted at a modification to the Flesher RTTY terminal unit that would enable it to run as an interface to some of the popular RTTY software. This month, thanks to information provided by Joe Masur AA5YA, of Perkins, Oklahoma, I can offer a way to accomplish this transformation.

This modification is for the Flesher TU-470 terminal unit. I do not have information regarding other Flesher units, but I'd like to hear of information developed in this vein by any of you.

General Information

Begin by unplugging the unit and removing the two rear screws. Slide the modem out of the case. Remove the one screw holding the main fuse and push it aside. For RS-232 operation, it is advisable to disable the loop supply by lifting CR7 and CR8. Then install a 4.7k 1/4 watt 5% resistor in the resistor position marked with "RX" between R20 and R25.

If you don't like to make up plugs, you can purchase a Radio Shack female DB9 to female DB9 serial cable, and cut it in two. You will have a spare three-foot piece for later use. All the cables will fit inside the DB25 connector housing.

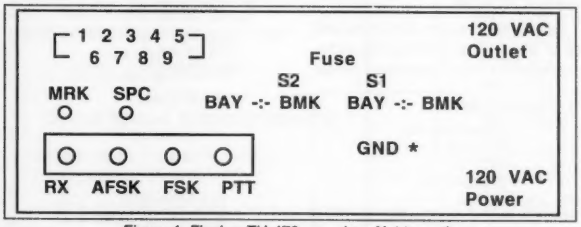


Figure 1. Flesher TU-470 rear view. Not to scale.

You will have to enlarge the outlet hole some, or pick one that will fit. You can also purchase three Radio Shack audio cables, double male, and cut them in two, as you will need five total: three to the radio and two to the scope. You could add the extra cable and then have the choice of operating AFSK or FSK. When marking the quad board, mark jack, and the DB9 connector locations, leave enough room at the outer edge for the terminal unit case.

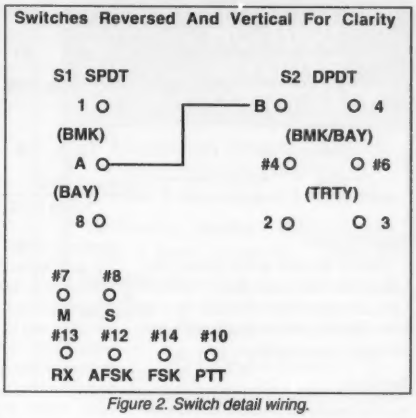


Figure 2. Switch detail wiring.

All of the cable grounds do not have to go to any special pins on the terminal unit, but pins 23 and 24 are not used. Use pins from 15 to 22 to make up the neatest arrangement, in any order possible.

Quad Jack Phono Board

Unsolder and remove the 25-pin connector from the PC board. Be careful not to damage the solder-through pads. Line up the quad jack board on the inside of the unit and mark with a pencil at each end on the rear frame. With a small file or Dremel tool remove 3/16 inch of the PC board between your pencil marks, or until there is enough room to insert the phono board. Mark and drill the mounting holes for the phone board and set aside.

DB9 Connector

Remove the loop supply plug and unsolder the lead to the PC board. Mark and form this hole to fit the connector and drill the two mounting holes. Cut and solder a three-inch length of proper color-coded wire to each of the eight pins and set aside.

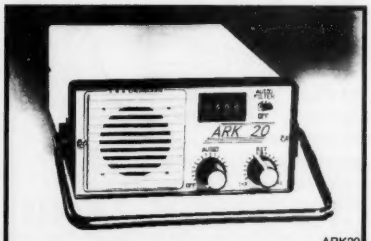
Silent Solar Power

The $349.00 Bullet-Tested QRV Solar Power Supply keeps your repeater on the air 'round the clock or powers your 100w HF station 60 hrs a month. Control circuit speeds charge, protects gel cells & sealed batteries. Fully assembled. QRV, portable. Easily expanded.

Add $10 S&H Info $1

AntennasWest
Box 50062 Provo UT 84605
(801)373-8425

CIRCLE 336 ON READER SERVICE CARD



ARK20
SYNTHESIZED QRP CW TRANSCEIVER KIT

- Superhet single signal receiver
- Synthesized to 100 Hz
- RIT + / - 500 Hz
- IIP > + 10 dbm
- Sensitivity 0.3 µV
- CW crystal filter
- CW audio filter
- Immediate recovery AGC
- 3-4 watts out
- FULL QSK
- Sinewave sidetone
- 12 VDC powered
- Rugged extruded chassis
- 2¾" X 5½" X 8"
- Coils pre-wound
- Silkscreened PCB's
- GUARANTEED TO WORK
- Product of USA

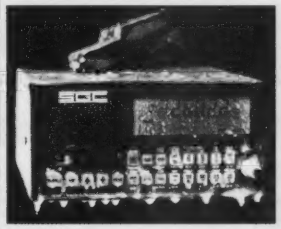
Complete - just add key, power & Antenna

20 Meter Kit or 40 Meter Kit $269.95
Optional adj. speed Keyer ..... $ 39.95
Shipping & Handling ..... $ 5.50
MD residents add 5% sales tax

To Order Call:
VISA MasterCard
S & S ENGINEERING
14102 BROWN RD
SMITHSBURG, MD 21783
(301) 416-0661 FAX (301) 416-0963

CIRLCLE 294 ON READER SERVICE CARD

BUY AMERICAN, BETTER PRICE AND QUALITY



The SG2000 HF transceiver is type accepted for commercial and marine service made with traditional U.S. commercial radio quality (and of course it can be used on the ham bands also). While the Japanese radios have 2 final transistors that strain to put out 100 watts on the low bands and only 75-85 watts on ten meters, the SG2000 has 4 large transistors that loaf along at 150 watts on ALL THE BANDS INCLUDING 10 METERS! Some of the SG2000 features are: 1) A control head remotable (no special kit necessary) up to 150' away from the rig, perfect for automobiles and boats. Up to 8 heads can be utilized and used as intercoms also. 2) The largest display of any HF transceiver. 3) 644 pre-programmed memories and 100 user programmable memories. 4) operable from -50F (-45C) to 185F (+85C). You want quality right? Here is what EVERY SG2000 must endure before they're shipped from the factory: 1) They're factory aligned, 2) EVERY SG2000 is keyed down at full power (CW 150 Watts) into an open antenna for about 10 seconds, then connected to a shorted antenna and keyed down for an additional 10 seconds. 3) EVERY SG2000 is put in the "BURN-IN" rack and keyed down for 24 hours non-stop at full power CW. Don't try that with the foreign radios. 4) EVERY SG2000 is then re-checked for alignment and put in the "TORTURE RACK" where they are keyed on and off every 10 seconds for 24 hours. 5) The SG2000 is then re-evaluated and all control functions are verified to ensure that the microprocessor is up to spec. THEN AND ONLY THEN IS THE SG2000 ALLOWED TO LEAVE THE FACTORY.

The bottom line is price, you know how expensive commercial rigs are normally, until DEC 31 we are selling the SG2000 BELOW DEALER COST at only $1,585.00 each!! That's a $400.00 savings! We guarantee the best price.

The SG230 SMART-TUNER is the best HF autotuner at any price, and to promote a product that is made in the USA, we're offering it at the guaranteed best price of only $449.00!! WHY THE SG230? BECAUSE: When you tune an antenna at it's base you are resonating the antenna, instead of just matching the coax to the radio as with other tuners such as the AT50, etc. The result YOUR SIGNAL GETS OUT MUCH BETTER. The Kenwood AT50, AT450 and other similar tuners can only match 3:1 mismatches (YES only 3:1) so forget matching anything but a fairly decent antenna. The SG230 can match from 0.5 Ohm to 10 kilohm antennas (up to a 200:1 mismatch), so it can easily match random wires, dipoles, rain-gutters, shopping carts, etc. The result MORE POWER.

To order, send check or money order with $8.50 for shipping, along with your shipping address (sorry no U.S. Post Office Boxes, UPS will not deliver) and Telephone number to:

Joe Brancato
THE HAM CONTACT
PO Box 3624, Dept 73
Long Beach, CA 90803

CA Residents Add 6 1/4% Sales Tax. Canadian Residents please send U.S. Money Order + $17.10 for shipping.

Serving The LORD Since 1987

If you wish more information please send a SASE to the above address. For COD orders, call (310)433-5860, outside of CA call (800)933-HAM4 and leave a message.

CIRCLE 384 ON READER SERVICE CARD

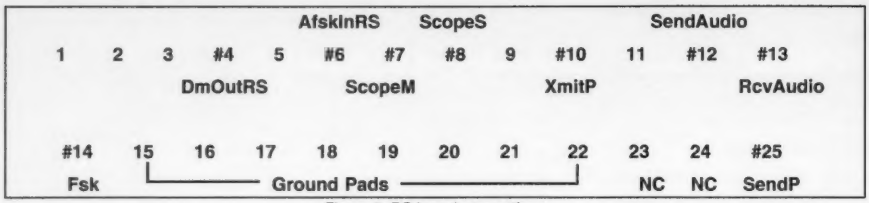

AfskInRS ScopeS SendAudio
1 2 3 #4 5 #6 #7 #8 9 #10 11 #12 #13
DmOutRS ScopeM XmitP RcvAudio
#14 15 16 17 18 19 20 21 22 23 24 #25
Fsk Ground Pads NC NC SendP

Figure 3. PC board connections.

Scope Outlets

Locate the two scope outlets between the phono jack board and the DB9 connector. Mark and drill the 1.4-inch mounting holes. Solder on wires as above and set aside.

Switches

Find the correct placement for the switches. Check to see that the fuse block can be mounted and that there is clearance, then drill a 1/4-inch hole for each switch. Do not install.

Wiring and Mounting Quad Board and Scope Jacks

Cut all lead lengths for neatness and short runs while making the connections. Solder all the ground lugs on the quad board in series with one wire with enough lead on one end to go to the ground lug on the terminal unit and the other end to go to the scope outlet ground lugs. Solder a three-inch wire to each center lug on the quad board and mount the board. Install the scope jacks. Solder the quad board ground wire to the terminal unit ground lug and the other end to the scope jack ground lugs. Then add one more wire to any convenient ground pad on the PC board and back to a scope jack ground lug.

Solder the four quad board and the two scope wires to the following PC board pads:

10	PTT	(XmitP)
12	AFSK	(SendAudio)
13	RX	(RcvAudio)
14	FSK	(Mark/Space)
7	MARK	(ScopeM)
8	SPACE	(ScopeS)

DB9 Connector and Switches

Install the connector and solder PC board wires:

5	BLUE	(Signal Gnd)	to a ground pad
7	GRAY	(SendP)	to pad 25

Solder a three-inch wire to #4 and #6 on S2 and install. Solder one three-inch wire to A on S1 and install. Solder A-S1 to B-S2 and to the PC board solder:

#4 to pad 4 (DmOutRS)
#6 to pad 6 (AfskInRS)
From the DB9 connector solder wires:
1 (RED) and 8 (WHITE) to S1
4 (GREEN), 2 (ORANGE), and
3 (YELLOW) to S2.
*** DOUBLE-CHECK YOUR WORK! ***

Mount the fuse block and the fuse. Slide the modem back into the case and secure with the two screws. This completes the modification to the terminal unit.

Any communication program that uses pins 2, 3, 5, and 7 of the run using the TRTY position. Operation details include the following:

Terminal Unit:	Serial cable to computer Front panel push-buttons to correct shift, etc.
Cables:	RX to radio audio OUT
AFSK:	AFSK to radio audio IN PTT to radio PTT jack
FSK:	FSK to radio MARK/SPACE/ FSK input jack PTT to radio RTTY/ KEY jack
Switches:	S1 S2 BMKMULTY BMK BMK (set software to TXR1/RXR1) BAYCOMM BAY BMK TRTY NC TRTY

Now, I defer to Joe for all of the in-

Parts List

#	Description	Radio Shack No.
1	Quad Jack Phone Board	RS-274-322
1	Pkg. shielded phono jacks	RS-274-346
1	DB9 male connector	RS-276-1537
1	SPDT toggle switch	RS-275-613
1	DPDT toggle switch	RS-275-620
3	3-foot audio cables	RS-42-2366
1	RS232C female/female cable	RS-26-116

RS232C Interface Data

PIN 1	RED	DCD	BMKMULTY RX
PIN 2	ORANGE	RXD	TRTY RX
PIN 3	YELLOW	TXD	TRTY TX
PIN 4	GREEN	DTR	BMK/BAY TX
PIN 5	BLUE	GND	SIGNAL
PIN 7	GRAY	RTS	PTT/FSK KEYING
PIN 8	WHITE	CTS	BAYCOMM RX
PIN 9	BLACK	RI	BMKMULTY FAX/TUNER

Join the FUN on the
SATELLITES
YES! Anyone with a Technician Class license or higher can work the

via the
OSCARs
Learn how: Join AMSAT today!
For a limited time, new members receive:
ORBITs - Tracking software for IBM compatable computers by W0SL
How to Use the Amateur Satellites - A great book by KB1SF
write or call
AMSAT
PO BOX 27 Washington, DC 20044
301-589-6062
CIRCLE 110 ON READER SERVICE CARD

NEW
AR1500
500KHZ TO 1300 MHZ. WITH BFO

AR1500. A ***1000 Channel*** Scanner with 500KHz to 1300 MHz coverage, & no cutouts. 10 search, 10 scan banks lockout on search & search&store. VFO tuning with AM/FM/ WFM modes. With Ni-Cad batteries, Chgr, VHF Ant., and long wire antenna, case & belt clip. Limited time offer, not valid with any other specials. Only 5.95 shipping & handling anywhere in the 48 states. Call toll free and order this new unit!
$449
ACE
COMMUNICATIONS
Call
1-800-445-7717
6975 Hillsdale Ct, Indianapolis IN 46250
317-842-7115 Fax 1-800-448-1084
CIRCLE 164 ON READER SERVICE CARD

formation on this rather extensive, but useful, modification. As he points out, with the ability of the Flesher TU-470 to work on these modes, there is no reason to cart one of these off to the flea market. Conversely, if you spot one at a bargain, you might just be inclined to give it a shot.

I look forward to hearing from you all, with the results of such future efforts. Thanks to Joe for the hard work, and all the information.

Now, having done all of this, getting the software to run with is a piece of cake. Just send a self-addressed stamped envelope for a current list of the "RTTY Loop" software disks, collections of programs available for the IBM PC compatible computers out there. Email sent to me on CompuServe (75036,2501), Delphi (MarcWA3AJR), or America Online (MarcWA3AJR) will be similarly answered. I look forward to your comments and questions online, or in the mail. I hope all of you have a good holiday season, and with all that is happening in the world, may we all look forward to a 1994 of peace for all the peoples of the world. 73

Subscribe to *73 Amateur Radio Today* Call 800-289-0388

From Micro Computer Concepts **RC-1000 REPEATER CONTROLLER**

• Autopatch • Reverse Autopatch
• User Programmable CW ID, Control & User Codes & Timeouts

Manual with schematics • 90-Day Warranty
Wired & Tested w/ manual **$239.95**

VISA MasterCard
Micro Computer Concepts
8849 Gum Tree Ave.
New Port Richey, FL 34653
813-376-6575

CIRCLE 160 ON READER SERVICE CARD

Factory Authorized Dealer & Service For
KENWOOD
YAESU
ICOM

Call Us For Great Prices & Great Service

TOLL FREE ORDER LINE 1-800-344-3144
Continental U.S. & Texas

ICOMM, INC. THE HAM CENTER SAN ANTONIO TEXAS
SALES AMATEUR RADIO SERVICE
5730 Mobud San Antonio, TX 78238 (512) 680-6110
FAX (512) 647-8007

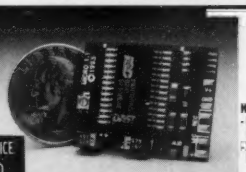
Small Talk
MICRO 1.1 & 2.1 VOICE RECORDER IDENTIFIERS

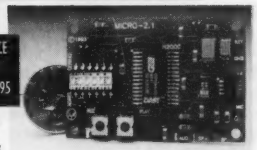
FULLY ASSEMBLED (NOT A KIT), INCLUDING MICROPHONE, SWITCHES AND FULL DOCUMENTATION

- SAVE YOUR VOICE DURING A CONTEST
- 60 OR 16 SECOND VERSIONS AVAILABLE
- STATION I.D.
- 100 YEAR MEMORY WITHOUT POWER
- NATURAL VOICE RECORDING
- 10KHz SAMPLE RATE
- 7-15 VOLT OPERATION
- INFINATE RECORDING (EEPROM)
- 8 OHM SPEAKER OUTPUT
- GREAT FOR BEACON OR FOX HUNTING

MICRO 1.1 INTRODUCTORY PRICE **$69.95** -16 SECOND 60 SEC. - $79.95

MICRO 2.1 INTRODUCTORY PRICE **$109.95** -16 SECOND 60 SEC. - $119.95





MICRO 2.1: 2.5" X 1.5"

MICRO 2.1: ADDITIONAL FEATURES
- COR OR SQUELCH KEYED - VARIABLE I.D.TIMER
- 5v KEY OUT PUT - MULTI-FUNCTION DIPSWITCHES
- AUDIO MIXING

AGRELO ENGINEERING
1145 CATALYN STREET SCHENECTADY, NY 12303

ORDERS ONLY: CALL 1-800-588-4300
TECH. SUPPORT: (518) 381-1057
TECH. FAX: (518) 381-1058

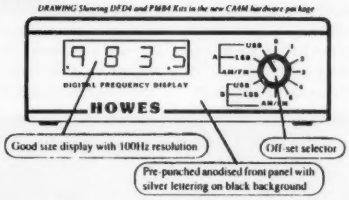
ORDER BY PHONE OR MAIL • IN U.S.A. ADD $3 FOR S&H
• C.O.D. CHARGES APPLY • NYS RESIDENTS ADD 7% SALES TAX

CIRCLE 281 ON READER SERVICE CARD

C.M. HOWES COMMUNICATIONS

Kits from Townsend Electronics, Inc.
P.O. Box 415
Pierceton, IN 46562
219-594-3661 FAX 219-594-5580

NEW KITS!


DRAWING Showing DFD4 and PMB4 Kits in the new CA4M hardware package
9835
DIGITAL FREQUENCY DISPLAY
HOWES
Good size display with 100Hz resolution
Off-set selector
Pre-punched anodised front panel with silver lettering on black background

The HOWES DFD4 is an add-on Digital Readout for analogue receivers and transceivers. If you have an FRG7, and analogue FT101 or a similar type of rig, then the DFD4 has been designed with you in mind. The DFD4 is a frequency counter that can be programmed for any IF offset so it can be used with almost any radio, including the old Government surplus sets. It can also count down as well as up, so it is suitable for "reverse tuning" rigs too.

To make the DFD4 even more suitable, we now offer the **PMB4** Programmable Matrix as an optional kit. This enables you to switch between six different programmed offsets, so the DFD4 can be used with more than one radio, and to compensate for IF frequency differences when switching modes. Also new is the **CA4M** "hardware package." This contains a custom made case with pre-punched anodized aluminum front panel (see drawing above), plus switch, knob, BNC socket, nuts and bolts, etc. to enable you to achieve a high standard of finish for your project.

DFD4 Kit	$71.95
PMB4 Kit	$17.95
CA4M Case & Hardware	$35.95
Ordered separately	$125.85
Ordered as a unit	$116.95

BUILD A QRP TRANSCEIVER!

To build a transceiver with our kits is a simple modular, step by step approach. You can start with the receiver, and then add on the transmitter at a later date if you wish. Various accessory kits are available to increase the facilities, these range from a simple signal meter for the receiver to extra filtering and of course, digital readout. We offer a matching range of "hardware packs" (case, knobs, etc.) to enable your station to look as good as factory equipment! Whether you fancy a single band CW transceiver, or more complex dual band SSB/CW rig, all these kits are designed to be within the scope of the ordinary home constructor. The well thought out designs and the backing of professional RF test facilities mean you can build with confidence!

Single band 40 or 80M CW transceiver:

DcRx 40 or DcRx 80 receiver kit	$28.95
CTX 40 or CTX 80 transmitter kit	$26.95
CVF 40 or CVF 80 VFO for TX & RX	$19.95
CSL 4 300 Hz CW and narrow SSB filter	$18.95
CA 80 M Case & Hardware (40 or 80)	$65.95
If ordered separately	$177.70
Ordered as a unit (state band)	$164.95

To order write or call:
1-800-944-3661 • VISA/MC accepted • Add $4.00 per order for S & H
ASK FOR OUR FREE CATALOG
Include $1.00 for 1st class Postage. $2.00 for foreign countries.

CIRCLE 299 ON READER SERVICE CARD

Number 14 on your Feedback card

CARR'S CORNER

Joseph J. Carr K4IPV
P.O. Box 1099
Falls Church VA 22041

Building Small DC Power Supplies, Part 1

Hams and other electronic hobbyists often need small, low-voltage, low-current, DC power supplies. Most solid-state circuits require these power supplies. Indeed, if you look at solid-state circuits published in this magazine you will see that +5 VDC, +9 VDC and +12 VDC are the most commonly specified DC power supply voltages. We also see the same voltages in negative polarity used sometimes, as well as variable voltages (e.g. 0-12 VDC). Current ratings for this class of DC power supply vary from 100 mA to 5 amperes, with 1 ampere being by far the most commonly seen. This month we will take a look at how these DC power supplies are selected and designed. While DC power supply theory has gone far beyond the material presented here (watts/cu. in. are way up and lbs./watt are way down in commercial supplies), these supply circuits are easy to build with components that are available at almost any parts distributor (including Radio Shack).

Safety First

The DC power supplies described in this article operate from 115 VAC, i.e. residential wall current. There is an unfortunate and very stupid belief that this type of current is only moderately dangerous. Indeed, when I worked as a biomedical equipment technician in a major hospital, I overheard an intern claim that 115 volts from the wall isn't dangerous because they taught him in medical school that it's the current not the voltage that kills. I leaned over the table and asked him if he'd passed high school physics on his way to an MD degree. Allowing, rather arrogantly that he had, I asked him if he'd ever heard of Ohm's Law. I then muttered to some people who were with me, "If he learned the rest of his medschool lessons the way he learned that one, will someone please shoot him on sight if he comes into the emergency room while I'm unconscious." The real fact is simple and brutal . . . so don't ever forget it: 115 VAC from the wall is potentially fatal. IT WILL KILL YOU if given a chance. A few guidelines will help:

1. Never work on a circuit that is plugged in.

2. Work on a dry, insulated flooring (I keep a masonite mat under my workbench stool).

3. Use a 1:1 isolation transformer to convert the one-side grounded AC power lines to a floating local power system.

I can't give you all of the information you need for safety under all circumstances, so please, please, please use some good sense when working with AC power.

The Basic LVLC Power Supply

Figure 1 shows the basic low voltage low current (LVLC) DC power supply sans switching and fusing. The basic components of the power supply are: transformer (T1), rectifier (BR1), ripple filter capacitor (C1) and a bleeder resistor (R1). We will take a look at other components, such as voltage regulators, later. But first, let's discuss the function of the basic components.

Transformer. The transformer (T1) serves to reduce the AC voltage from the power mains to a level required by the DC circuits to be served by the power supply. We will shortly discuss what voltage and current ratings are needed for any given application.

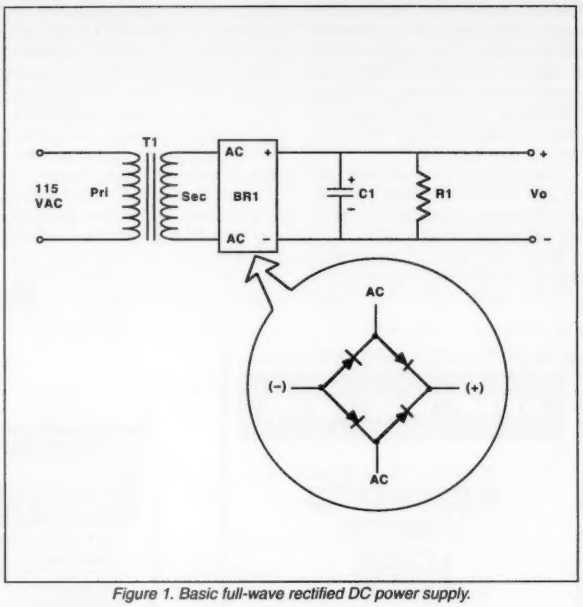


Figure 1. Basic full-wave rectified DC power supply.

Rectifier. The rectifier consists of diodes that convert bidirectional alternating current (Photo A) from the power mains to unidirectional pulsating DC (Photo B). There are two basic classes of pulsating DC: half-wave rectified and full-wave rectified. The half-wave rectified type only uses half of the AC input waveform, while the full-wave version (shown in Photo C) uses both halves of the AC waveform. Note that there are no spaces between the "humps" of the full-wave rectified version. In the half-wave rectified form there would be a flat line between humps representing the time taken by the rejected half wave. The output frequency of a half-wave rectifier equals the AC line frequency (e.g. 60 Hz in USA and Canada); the output frequency of the full-wave rectified pulsating DC is twice the line frequency (e.g. 120 Hz in USA and Canada).

In Figure 1, a "bridge"rectifier is shown in the circuit. An inset shows the "innards" of the bridge rectifier, which is a ring of rectifier diodes.

Ripple filter. The pulsating DC from the rectifier is almost as useless to solid-state electronic circuits as AC. The ripple filter smoothes the pulsating DC to make it much nearer to the pure kind-you-get-from-a-battery DC.

Bleeder resistor. The bleeder resistor serves two purposes. First, there is the issue of safety. Charged capacitors can be dangerous. While 12 VDC is not usually dangerous to intact humans, it can produce damage to circuits. In addition, if you wear a ring or watch or other jewelry, it is possible for the current stored in a large low-voltage capacitor to cause a nasty burn. Not likely, maybe, but life is full of nasty little "not-likely" surprises. The second use

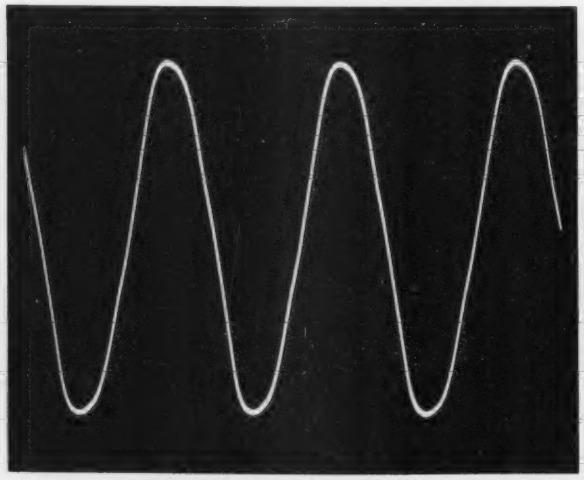


Photo A. The 60 Hz AC input to rectifier.

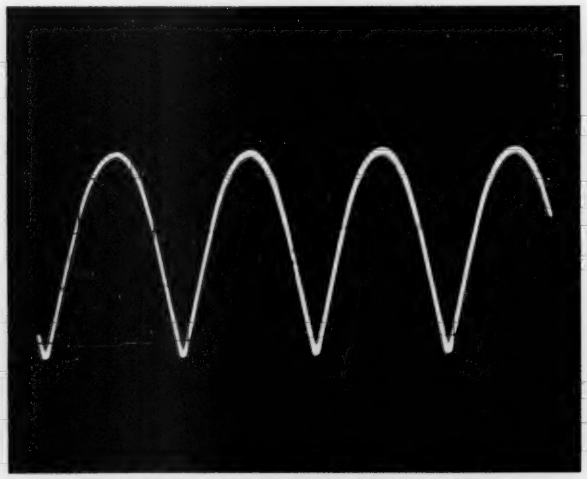


Photo B. Full-wave rectified pulsating DC output of rectifier.

1691 MHz Weather Satellite System

1691 MHz Hemt Pre-amp. model TS-1691-P. Amp	$250
1691 MHz Receiver model TS-1691-Recvr	$450
Decoder Board & Software model TS-VGA-SAT4	$349
Low Loss (microwave) Coaxial Cable (65ft) with connectors. model 1691-coax ass'y	$65
Track II Satellite Orbital Program. Tracks ALL satellites, world map, print out	$99
1691 MHz Loop Yagi Antenna model 1691-LY(N)	$99
1691 MHz Loop-Yagi Extension model 1691-LY-XTN	$85
Demonstration Disc (IBM-PC VGA compatible) of signals recorded from WX-SAT system.	$3

Shipping: FOB Concord, Mass.
Prices subject to change without notice.

MasterCard VISA

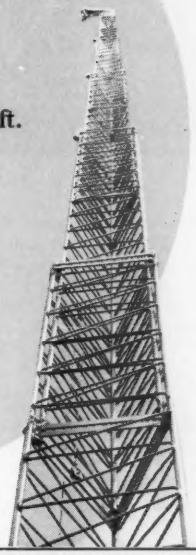
SPECTRUM INTERNATIONAL, INC.
Post Office Box 1084, Dept. S
Concord, Mass. 01742, U.S.A.
Phone: (508) 263-2145
Fax: (508) 263-7008

CIRCLE 183 ON READER SERVICE CARD

HEIGHTS TOWER SYSTEMS

Come up to a higher level with Heights, the name that says it all . . .

- Self-supporting tapered towers to 144 ft at 70-80 mph winds.
- Super-duty Crank-up Towers to 116 ft.
- Fold-Over Kits & Motorized Options
- High ("Heights") Standards in DESIGN and QUALITY . . . Compare to other brands - the differences are astounding!
- Flexible and easy installations



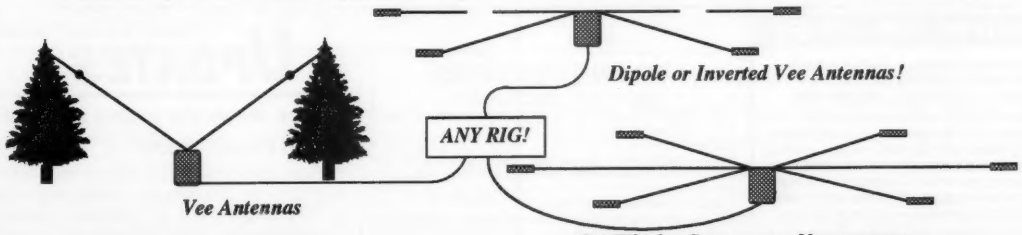
9505 Groh Road Bldg. 70E
Grosse Ile, MI 48138
(313) 692-6711

Pioneers in aluminum tower manufacturing ~ since 1959 ~

CIRCLE 284 ON READER SERVICE CARD

3 to 12 dB MORE FROM YOUR DIPOLE, VEE OR LONGWIRE BASE STATION ANTENNA!

SGC's SG-230 computer controlled coupler works with any radio and any antenna system - fixed or mobile, marine or aircraft.



SG-230 SMARTUNER™

SGC's SG-230 Smartuner™ will outperform any built-in antenna coupler on any radio. The reason? The SG-230 mounts AT THE ANTENNA! This means you're matching the precise condition of the antenna - not just loading up a feedline and shunting power to ground. Ask any Smartuner user - this unit delivers great performance on any frequency from 1.8 to 30 MHz. Call for a free package of information from SGC, 1-800-259-7331 or circle our Reader Service number.

SGC

P.O. Box 3526
Bellevue, WA 98009 USA
Tel: 206-746-6310
Fax: 206-746-6384

CIRLCLE 188 ON READER SERVICE CARD

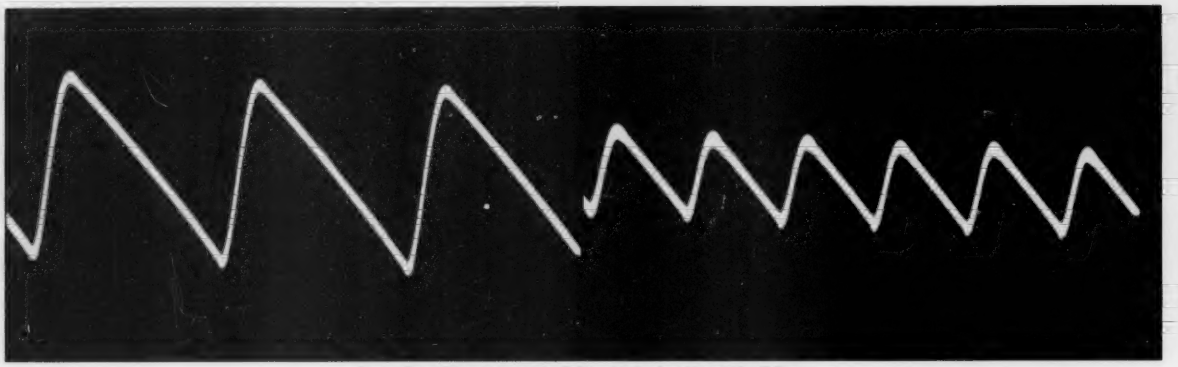


Photo C. a) Ripple with 100 µF filter; b) ripple with 1,000 µF filter.

for the resistor is to provide a minimal load to the rectifier. I've seen high-current low-voltage power supplies cause problems for marginally rated filter capacitors when the load was removed. It seemed that the pulsating DC peak voltage rose dramatically.

Component Ratings

The rectifier should be selected according to two ratings: peak inverse voltage (PIV), also called peak reverse voltage (PRV), and the forward current. The PIV rating is the highest reverse bias voltage that the diodes inside can tolerate without destruction. The general rule to follow is this: The minimum PIV rating should be greater than 2.83 times the RMS voltage rating of the transformer (T1) secondary winding. The reason for this value is that the diode will see the peak voltage from the transformer (1.414 Vrms), and this voltage charges the ripple filter capacitor (C1) to the same level. Thus, the reverse bias voltage seen by the rectifier is 2 X (1.414 Vrms), or about 2.83 Vrms. This minimum PIV rating is not usually a problem. Indeed, you can eliminate the problem altogether if you use 1,000 volt PIV diodes or bridge rectifiers. If you go to most parts distributors, you will find 1,000 volt PIV ratings on most of the diodes available.

The transformer (T1) is selected to produce the required voltage. The average voltage across the filter capacitor after only a few cycles (milliseconds) will be about 0.9 times the peak voltage, or VC1 = (0.9)(1.414)(Vrms). Thus, a 12.6 VAC "filament" transformer will produce nearly 16 volts across the filter capacitor.

The current rating of the transformer secondary winding should be twice the expected maximum load current. For example, if you are building a 1 ampere DC power supply, then use a 2 ampere transformer. This guideline assumes that full-wave rectification is used. Many times I've violated this rule, and gotten away with it largely because the circuits I've built generally use a lot less than the maximum current. The maximum 1 ampere (1,000 mA) current drain usually only occurred briefly. However, 2 ampere transformers are easily available, so the guideline makes sense. Also, if you violate the rule, check the transformer's operating temperature with the thumb test: Run the power supply for about five minutes, unplug it from the AC power mains (safety first!) and then quickly and gingerly touch the transformer's metal frame with your thumb. If it runs hot enough to burn then it's running at too high a current load.

The filter capacitor has two ratings to consider: capacitance and working voltage direct current (WVDC). The WVDC rating refers to the maximum voltage that the capacitor can tolerate on a continuous basis. I am generally quite conservative about this rating. First, assume a 20 percent tolerance: The minimum allowable WVDC rating should be 1.2 times the maximum pulsating DC that will be applied to it. I generally prefer a 2X margin, rather than 1.2 margin. Generally, whenever one sees a piece of equipment that has frequent problems with the filter capacitors "going west" it can be traced to using a supposedly safe but low margin of safety. In other words, for a power supply with a 12.6 volt transformer, which outputs about 16 volts peak, use a 25 VDC capacitor at minimum, and prefer 35 WVDC and 50 WVDC models.

The capacitance required for the ripple filter depends on the degree of ripple suppression required, and the ripple frequency. The ripple frequency of half-wave rectified power supplies is 60 Hz in North America, so these require about twice the capacitance as full-wave rectified power supplies (120 Hz ripple frequency).

Photo Ca shows an AC-coupled (to eliminate DC offset) oscilloscope presentation of the ripple present on a lightly loaded 1 ampere 12 VDC power supply with a 100 µF filter capacitor (C1 in Figure 1). Without changing the settings of the oscilloscope, Photo Cb shows the same power supply, under the same conditions, when a 1,000 µF is used in place of the 100 µF capacitor. Note the substantial reduction of ripple.

In some cases, the ripple reduction of Photo Cb is good enough. However, there are many cases where a considerably better degree of ripple suppression is needed. Those cases require a voltage-regulated DC power supply . . . which is the subject of next month's column. 73

SCARED OF THE CODE?

IT'S A SNAP WITH THE ELEGANTLY SIMPLE MORSE TUTOR ADVANCED EDITION FOR BEGINNERS TO EXPERTS—AND BEYOND

Morse Code teaching software from GGTE is the most popular in the world—and for good reason. You'll learn quickest with the most modern teaching methods—including Farnsworth or standard code, on-screen flashcards, random characters, words and billions of conversations guaranteed to contain every required character every time—in 12 easy lessons.

Sneak through bothersome plateaus in one tenth of a word per minute steps. Or, create your own drills and play them, print them and save them to disk. Import, analyze and convert text to code for additional drills.

Get the software the ARRL sells and uses to create their practice and test tapes. Morse Tutor Advanced Edition is approved for VE exams at all levels. Morse Tutor is great—Morse Tutor Advanced Edition is even better—and it's in user selectable color. Order yours today.

For all MS-DOS computers (including laptops). Available at dealers, thru *QST* or *73* or send $29.95 + $3 S&H (CA residents add 7.75% tax) to: GGTE, P.O. Box 3405, Dept. MS, Newport Beach, CA 92659 Specify 5¼ or 3½ inch disk (price includes 1 year of free upgrades) 73

CIRCLE 193 ON READER SERVICE CARD

TRANSVERTERS

VHF UHF MICROWAVE

Linear transverters convert IF frequency (28 or 144 MHz) to higher frequency, transmit and receive — all modes.

DEM 50-28K
6 Meter Kit. 28 MHz IF 20W out high dynamic range GaAsFET 12-14VDC. Kit includes assembled main PCB, Hybrid Amp module. Box heatsink, connectors. **$295**

DEM 144-28K DEM 222-28K
As above for 2M amd 222 MHz, 20W. Also available assembled and tested and in complete kit form. ..... WRITE

DEM 432K
70cm Kit. 28MHz IF 70mW out, no-tune design. **$155**

DEM 432-15S
70cm, assembled and tested. 15W with internal TR switching and dual L.O. (432 and 435 MHz) **$395**
Also still available — no-tune transverters for 900 to 5760 MHz. ..... WRITE

NEW! **DEM 144-28DCK.**
Complete low power 2M transverter board 1-10mW out. Can be used alone or with microwave transverters for double conversion to 28 MHz IF. Kit. **$109**

Coming soon 10 GHz! WRITE

Also available: poweramps, preamps, antennas, antenna relays, coax, components.

FREE Catalog available.

DOWN EAST MICROWAVE
BILL OLSON W3HQT
RR 1, BOX 2310
TROY, ME 04987-9721 USA
PHONE (207)948-3741
FAX (207)948-5157

MasterCard VISA

Number 15 on your Feedback card

UPDATES

Active Antenna Using a MOSFET
by Ken Cornell W2IMB

Please refer to the above article in the March 1993 issue, page 32. The parts list correctly sets the values for RF chokes 1 and 2 at 1 millihenry; however, the schematic depicted them (incorrectly) as 1 microhenry RFCs. TNX to Victor Bennight for spotting the mistake. The author makes another good point. He suggests that you set the R1 pot to its mid-point before applying power. (Adding a series resistor would provide an additional margin of safety for the MOSFET.) 73

Sell your products in *73 Amateur Radio Today*
Call Dan Harper
800-274-7373

DYNAMIC DUO

DR-130T

Works Hard / Runs Cool

ALINCO's newest 2-Meter mobile, the DR-130T, packs a big punch. This compact radio delivers 50 Watts of cool running power, and offers the durability and reliability that Hams have come to expect from ALINCO.

Standard features include 50 CTCSS Tones, Programmed Memory scan, Programmable "Time-Out" Timer, CTCSS Encode, and others. With the optional EJ-19U plug-in module, 100 memory channels are available. All memory channels can store "odd-split" frequencies, and also store CTCSS Encode/Decode status.

DJ-180T

Clearly Superior

Ergonomic, rugged design, combined with excellent sensitivity and great sound make this the radio of choice for demanding operators.

This rig comes standard with CTCSS encode and decode. Ten memory channels come standard, and the unit can be upgraded to 50, or even 200 Memory Channels with optional plug-in chips.

Odd Splits! This radio can store repeater offsets from 0 to 15.995 MHz. A different offset can be stored in each memory channel, and most other functions can also be stored independently in each memory channel.

DR-430T 70 cm Mobile available now!

ALINCO ELECTRONICS INC.

438 Amapola Ave., #130
Torrance, CA 90501
Phone :(310) 618-8616
Fax :(310) 618-8758

Holiday Price Break

Discounts available thru Dec. 31 '93

DR-600T	DJ-F1TH	DJ-580T	DR-130T
$30	$20	$20	$10

SEE YOUR ALINCO DEALER FOR DETAILS

CIRCLE 67 ON READER SERVICE CARD

HOMING IN

Radio Direction Finding

Joe Moell P.E. KØOV
P.O. Box 2508
Fullerton CA 92633

Testing the Ramsey Foxhound

You can tell that a ham radio activity is gaining popularity when established manufacturers begin to supply equipment for it. Until recently, hidden transmitter hunters (sometimes called foxhunters or T-hunters) had to build their own gear or buy it from a few companies specializing in radio direction finding (RDF) sets, such as Doppler Systems and BMG Engineering.

The big three manufacturers from JA-land aren't making T-hunt products yet, but at least one well-known US mail order company has begun to supply this growing market. Last winter's Ramsey Electronics catalog announced two new items of foxhunting gear. The "SlyFox" transmitter is still futureware as of this writing, but the DF-1 "Foxhound" direction finder is available at hamfests, from dealers, and by mail order from the factory (see Photo A).

A Versatile TDOA Set

Mobile VHF T-hunters usually use a Doppler unit with its ring of antennas, or the amplitude-based RDF method (beam, attenuator, and S-meter). In contrast, the Foxhound is a "homing" type of RDF set. Homing RDFs have two vertical antennas—dipoles in this case—spaced less than a half wavelength apart, plus some sort of left-right indication (LEDs, meter, or tone pitch change).

There are two look-alike kinds of homing RDFs: switched cardioid pattern and time-difference-of-arrival (TDOA). Of the two, hams prefer TDOA units because they work with unmodified VHF-FM transceivers and do not require an RF attenuator at the receiver input. The DF-1 is a TDOA unit, similar in principle to a number of sets that have been developed since the early 1980s.

RF diodes in the Foxhound switch the receiver input rapidly back and forth between the two antennas at about 1 kHz (see Figure 1). When the incoming signal wavefront arrives at one antenna before the other (as for transmitters #1 and #3), the antenna switching produces pulses out of the receiver's FM discriminator, heard as a tone mixed with the received audio.

The phase of these pulses is detected within the DF-1 circuitry, activating the left or right indicator as appropriate. When the two antennas are equidistant from the source (as is transmitter #2 in Figure 1), no tone is heard and no LEDs light. A sharp null in the tone gives a precise line of bearing to the fox.

Using a homing RDF set is easy. Watch the indicators and listen to the RDF tone while you hold the unit and turn slowly. You should hear two distinct nulls in the RDF tone, 180 degrees apart. You are facing the direction of incoming signal when the tone is nulled and movement to the left makes the "turn right" indicator come on. Conversely, your movement to the right makes the "turn left" LED light. If the opposite happens, do an about-face and try again.

By walking, turning, and following the null and lights, you home in on the fox. The Foxhound is designed only for on-foot "sniffing." Using it in motion on a vehicle would be unsafe, unless you build a special rotating antenna system with extended coax lines so that the antenna pair is outside the vehicle and the rest is inside.

The DF-1's manual cover lines proclaim that it "works with any radio, any frequency." Not exactly. TDOA sets need carrier-type signals, such as CW or FM. They aren't designed to track SSB or broadband impulse noise. The receiver must have an FM detector. AM and product detector sets will not work with it.

The two TDOA antennas must be less than a free-space half-wavelength apart. The PVC-pipe-frame antenna pair described in the manual (23-inch spacing) is intended for 2 meters, but will work over a wide frequency range. You can use it with your extended-receive-range handheld or scanner to track signals in the business and maritime bands below 250 MHz. For higher bands, the dipoles must be shorter and closer.

Theoretically, the supplied whip set works on 6 meters, but the nonresonant antennas and short spacing results in too little DF tone from the receiver. A bigger antenna system is needed below 108 MHz. Portable use of the DF-1 on 80-10 meters is not practical because an effective antenna set would be excessively large.

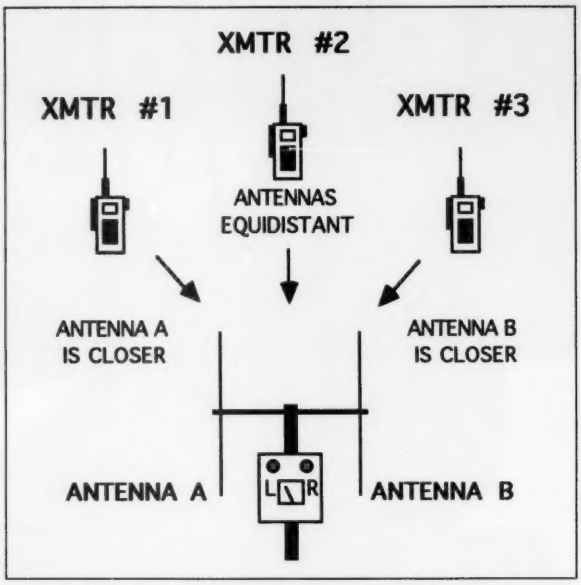


Figure 1. TDOA RDF sets such as the Ramsey Foxhound find direction by determining which of its two vertical antennas is closest to the transmitter.

If At First . . .

The Model DF-1 kit (Photo B. Price $59.95) includes a circuit board, all necessary components, meter, gain control, whip antennas, miniature coax, and instruction manual. You will need a case for physical protection and for meter and gain control mounting. The optional Model CDF case set (Photo C., $12.95) includes a clamshell enclosure which is predrilled and lettered, plus all essential hardware.

An antenna framework is not provided. The manual shows how to make a frame for 2 meters from inexpensive PVC pipe and fittings. The whips mount on small circuit boards inside the pipe. (See Photo D.)

Ramsey supplied their Revision 1.0 kit for review. The circuit board was marked DF4 Rev 1.4 10/12/92. It took me one evening to populate the board and another to construct the antenna system. Aside from minor part discrepancies and some missing hardware, it went smoothly.

When I set up my test transmitter and powered up this early version, the performance was disappointing. Sometimes the meter would "hang" or bounce for no apparent reason. RDF indications were not trustworthy. The right indicator was on most of the time and the left indicator seldom came on.

Probing the DF-1 board with a scope showed clock noise and oscillation at the active tone filter output and on the Vcc lines. The favoring of one indicator appeared to be caused by asymmetry of the antenna switching waveform, which should be a

Photo A. Aha! It's in the trashcan! Jason McLaughlin KD6ICZ shows how to "sniff" out a hidden 2 meter transmitter with the Ramsey Foxhound. The unit connects to the antenna and earphone jacks of his handie-talkie.

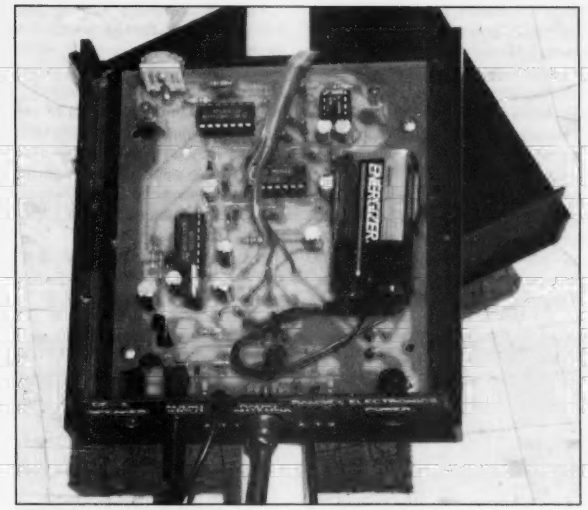


Photo B. The spacious circuit board is easy to assemble. For ease of troubleshooting, I used ribbon cable instead of the supplied short jumper wires to panel components. The Ramsey-recommended 9 volt battery is shown, but I later changed to 12 volt power.

Photo C. The Df-1 circuit board is designed to fit into the optional CDF plastic case. Coax and connector locations on the revised board are different from this original model. It's wise to order the case and board at the same time to be sure they are compatible.

50% square wave to minimize harmonics in the DF tone at the receiver output. A couple of electrolytic capacitors were installed according to the instructions, but were not observant of correct polarity for this circuit.

I suggested some circuit changes to Ramsey Electronics engineer Tom Hodge WA2YTM and he agreed to review the DF-1 design. A few weeks later, a Revision 1.3 kit arrived. Its new circuit board (DF1 Rev 2.0 5/13/93) had fixes to provide a square-wave switching waveform, better supply filtering, and proper capacitor polarity. Several glitches in the manual had been corrected and there were no missing parts.

After another session with the soldering iron (it went much faster the second time), the new board was ready to test. Now, with a fresh 9 volt battery, I was able to get good metering null and usable left-right indications with my test fox.

Raise the B+

The Foxhound uses a MF5 active filter IC, which is temperamental about its power source. When Vcc dropped from 9.5 to 7.8 volts after a few hours, it went into uncontrollable oscillation. Duracell specifies end-of-life of a standard MN1604 alkaline battery at 4.8 volts. Thus, much of the battery's capacity is wasted by replacing it at 7.8V.

I substituted a series pair of 6 volt Duracell 7K67 batteries in place of the MN1604 battery. These "J-size" batteries are widely sold for replacement in TV remote controls, etc. Each 7K67 has the same ampere-hour rating as an MN1604. Although DF-1's current drain is slightly higher at 12 volts than at 9 volts, the J's last much longer because they can be used to near end-of-life voltage.

Performance of the DF-1 is noticeably better on 12 volts, compared to 9 volts. The meter circuit is much more sensitive and the left-right indicators flicker less. I couldn't find holders for the J batteries and the tabs would not take solder, so I pried out the tabs, crimped them to stranded wires, and hooked the wires to the connector from an old 9V battery. Double-sticky foam tape holds the batteries to the board.

The Foxhound has a power jack on the bottom panel for external supply. If you don't mind another dangling wire, you can use it to supply 12 volts to the board. If you do this, be sure to remove all internal batteries. The steering diode in series with the battery was deleted when the board was revised. If you don't remove internal batteries, the external source will attempt to charge them with no current limiting. Damage to batteries or your supply could result.

Foxhound Pluses and Minuses

Most TDOA sets require you to listen carefully to the DF tone to detect the exact null. The DF-1 is the first set I have seen with a panel meter to help you find the null. Usually your ear is the best null detector, but the meter is useful when hunting in locations with lots of acoustic noise, or when there is heavy voice or tone modulation on the bunny's signal.

Plugging the DF-1's audio cable into your receiver disables its speaker. The only way to hear the hidden T and its tone null is to plug an earphone into a jack on the bottom of the DF-1. I don't like a tangling earphone cord when I'm tramping through the brush. Furthermore, the mini-jack supplied by Ramsey is the wrong size for my ICOM earplugs, so I added a 1-1/2-inch speaker inside the DF-1 case. The speaker is wired to the normally closed terminal on the DF-1 earphone jack, so an earphone can still be used if desired.

With no audio from the radio, both LEDs are off. It's easy to forget to turn off the Foxhound's power after the hunt. To remind you to save the battery, you may wish to add an LED power-on indicator.

In Conclusion

The Foxhound adds sniffing capability to your RDF arsenal for less than 73 bucks. Its left-right LEDs give an unambiguous direction indication. The spacious circuit board is well documented to help you build and modify it to your particular needs. When powered by a 12 volt supply, its performance on 2 meters is comparable to competitive TDOA RDF sets for on-foot foxhunting.

If you already have an early model DF-1, I recommend upgrading it to the latest circuit for best performance. John Ramsey told me his company will provide modification instructions on request. Ramsey Electronics is at 793 Canning Parkway, Victor NY 14564; telephone: (716) 924-4560.

Remember that there are certain RDF situations where all TDOA units work poorly. Horizontally polarized signals are much more difficult to track than vertical, because signal reflections are enhanced relative to the direct signal on the vertical whips. Weak signals may be masked by noise from antenna switching. A properly polarized beam or quad is needed in those special situations.

Tracking in severe multipath (inside a building, for instance) is difficult with a TDOA, too. But when signals are strong, vertical, and in the clear, the TDOA will give sharper bearings than a beam, and bearings will be easy to get even if the fox transmitter is changing power. 73

Photo D. A close-up end view of one antenna. Ramsey supplies the telescoping whips, small circuit boards to mount them, and miniature coax. You provide the PVC pipe frame.

Number 17 on your Feedback card

HAMS WITH CLASS

Carole Perry WB2MGP
Media Mentors, Inc.
P.O. Box 131646
Staten Island NY 10313-0006

New Resources

At the beginning of every school year, I like to force myself to search out new resources to use in the classroom with my ham radio classes. There are lots of commercially prepared materials that are highly publicized that I use year after year to prepare the kids for the license exams. I realize, however, that it's important to continuously be on the lookout for new resources and new ideas.

With the delay of school opening in New York City due to the asbestos crisis, I've had time to peruse some wonderful new teaching aids and materials that I'll be adding to my program. In the spirit of sharing, I'll describe the new resources I'll be incorporating into my ham radio curriculum.

Alpha and Zulu

Riding The Airwaves With Alpha and Zulu by John Abbot K6YB is a delightful soft-covered book that uses comic book characters, the Phonetic-cos, to prepare you to take two different amateur radio license exams, the Novice and the No-Code Tech. One-hundred-and-twelve comic strips review all the questions and answers. If you look closely at the Phonetico characters you will notice that each one of their bodies is made up of Morse code "Dits" and "Dahs" that form the correct symbol for that character's letter.

After each cartoon page is a testing page. The answers may be found on the following page on the bottom left side. There are puzzles, connect the dots, word searches, games, and projects throughout the book.

This book will be a fine addition to any teacher's library. It retails for $15 from Artsci, Inc., P.O. Box 1428, Burbank CA 91507; (818) 843-4080.

The Art of Science

If you're a teacher working with older or more advanced students you should take a look at a book called *The Art of Science* by Joe Carr K4IPV. This book is an excellent resource and guide for teachers and students alike that addresses the practical "how to do it" phase of scientific experimentation.

Joe discusses how to choose the type of experiment best suited to your application, how to keep professional quality scientific records, how to make accurate measurements and correctly estimate errors, how to present your results like a "pro," how to think critically about your theories, and how to spot fallacies in the arguments of others.

For the serious students who participate in science fairs, there are valuable lessons in this book. Too often we forget to teach the basics of scientific inquiry and we neglect to give the students the tools they need to be creative yet exacting in their efforts.

The book is available from Hightext, P.O. Box 1489, Solana Beach CA 92075; (619) 793-4141.

Slow-Scan Program

The ham radio students in my classes always enjoy working with Slow-Scan TV. John Langner WB2OSZ has a terrific package available for $229.95. Pasokon TV is the interface, software, and manual, assembled and tested.

Here are some features: It can send and receive all popular modes. The interface fits inside the computer. It can

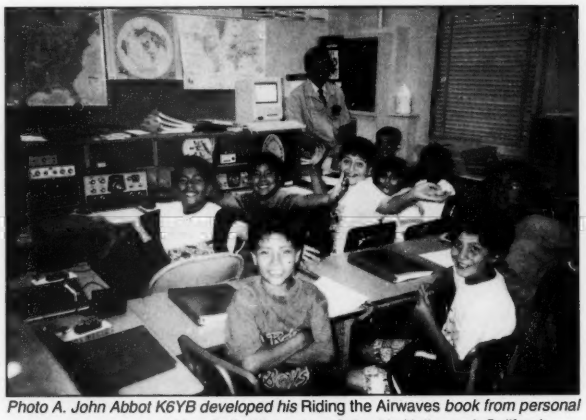
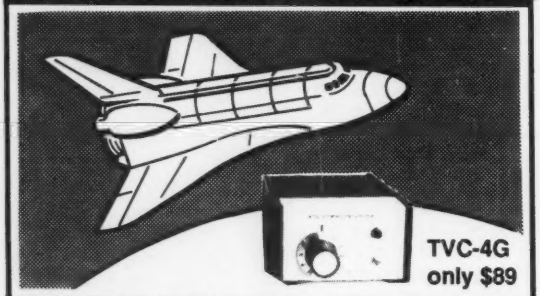


Photo A. John Abbot K6YB developed his Riding the Airwaves *book from personal classroom experience at Los Feliz Elementary School in Hollywood, California.*

AMATEUR TELEVISION



TVC-4G
only $89

SEE THE SPACE SHUTTLE VIDEO

Many ATV repeaters and individuals are retransmitting Space Shuttle Video & Audio from their TVRO's tuned to Satcom F2-R transponder 13. Others may be retransmitting weather radar during significant storms. If it is being done in your area on 70 CM - check page 413 in the 91-92 ARRL Repeater Directory or call us, ATV repeaters are springing up all over - all you need is one of the TVC-4G ATV 420-450 MHz downconveters, add any TV set to ch 2, 3 or 4 and a 70 CM antenna. We also have downconverters and antennas for the 900 and 1200 MHz amateur bands. In fact we are your one stop for all your ATV needs and info. Hams, call for our complete ATV catalog - antennas, transceivers, amplifiers. We ship most items within 24 hours after you call.

(818) 447-4565 m-f 8am-5:30pm pst. Visa, MC, COD
P.C. ELECTRONICS Tom (W6ORG)
2522-WG Paxson Ln Arcadia CA 91007 Maryann (WB6YSS)

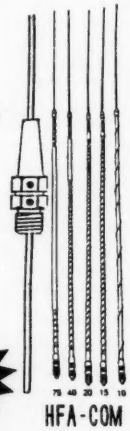
ASA

"FIBERWHIPS"
MONO BAND WITH HFA-COM
5 Pack Consists of 75, 40, 20, 15, 10 Meter Whips in One Pack

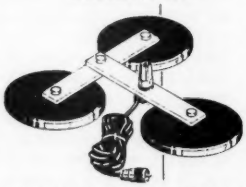
Model/Mtr	MHz
HFA10	28.0-29.7
HFA15	21.0-21.45
HFA20	14.0-14.35
HFA40	7.0-7.3
HFA75	3.5-4.0

• HEAVY GAUGE • NICKEL CHROME • BRASS FITTINGS
• 250 WATTS POWER • APPROX. 8' LENGTH • AVAIL. IN BLACK

$69.50 Per Set
Single Whips Available $17.75



"THE BLACK BOA"
MODEL TRI-401B
Made in USA



Specifications
• 3 True 5" Magnets
• 500 lb. PSI
• 3/8 x 24 Mount
• 17' RG58 with PL-259
• 12 x 12 x 12 Footprint

$44.02 Each

+$5.00 S&H (SC Residents Add 5% Sales Tax) Check in Advance or C.O.D.

ASA
PO Box 3461
Myrtle Beach, SC 29578
1 - 800 - 722 - 2681

100% Guaranteed

CIRCLE 18 ON READER SERVICE CARD

read and write popular image file formats. It has user-defined menu items for running external programs, such as N9AMR's HiRes32. It displays color pictures in real-time during reception. It has an on-screen tuning indicator and has automatic fine tuning of signals up to 100 Hz off frequency.

The hardware requirements are as follows: IBM PC/AT or compatible, one empty expansion slot, '286 or later CPU, 640K memory, VGA display adapter, and a color monitor.

These wilderness and adventure stories, *Night Signals, Hostage In The Woods*, and *Firewatch*, will enchant and enthrall any youngster. The characters are easy for most kids to identify with. My students enjoy the fast-paced action and they like the way ham radio has been incorporated into the story. These books will be highly motivational and a fine addition to your classroom library. They retail for $5.95 each.

I cannot stress enough how important it is for teachers to keep *themselves* stimulated with new and challenging materials in the classroom every term. You owe it to yourself as a professional, and you certainly owe it to your students, to utilize the latest techniques. So, avail yourself of new resources whenever possible.

"I cannot stress enough how important it is for teachers to keep themselves stimulated with new and challenging materials in the classroom every term."

Contact John for further details at 115 Stedman St. #M, Chelmsford MA 01824-1823; (508) 256-6907.

Cynthia Wall

Authoress Cynthia Wall KA7ITT was one of the guest speakers at a seminar I conducted at the Texas Hamcom last June. She spoke about the series of books she has written that are being sold through the ARRL. I was very pleased to have a chance to meet with her and to read her three terrific books. I see the potential for using them in the classroom.

One great place where teachers can meet to exchange ideas is on the CQ All Schools Net every Tuesday and Thursday at 17:30 UTC on 28.303 MHz. Listen up for net controls Carole WB2MGP, Gordon WB6NOA, and Jim N4MDC.

LOOK WHAT'S NEW FROM DAIWA

.....Have You Seen These Great NEW Products From Daiwa?.....

DAIWA

NEW

MH-200 - Lightweight, folding "personal stereo"- type single earpiece headset and flexible boom mic. Inline locking or momentary P.T.T. switch. Models for Kenwood, Icom, Yaesu and others.

ME-300 - Tiny in-the-ear headset with high quality tie-clip mic and inline locking or momentary P.T.T. switch. For Kenwood, Icom, Yaesu and others.

MD-400 - Compact, high quality gooseneck- type desk mic with P.T.T. and up/down buttons. Deluxe weighted di-cast base. Superb audio. Complete with attractive foam windscreen. Models pre-wired for Kenwood, Icom and Yaesu.

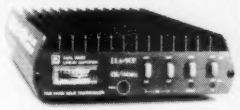
NEW

Compact, Full Duplex, GaAsFET Pre-amps!

DLA-25H - The perfect companion for dual band HTs while mobile! 25+ W kick on either band w/ 200mW to 6W drive for solid repeater coverage. Front panel output meter, switchable, all-mode for CW/ SSB.

DLA-50H - 50+W out on both 2 meters & 440MHz w/ 200mW to 15W drive. Plenty of power for those DX repeaters & reliable simplex operation. The perfect medium power dual band HT amp - and only from Daiwa!

DLA-80II - Heavy duty version, high power dual band linear amp. Full output (80+VHF, 60+UHF) from 3-25W drive - perfect for dual band HTs and mobile rigs!. All-mode operation for CW/SSB, built-in fan for continuous-duty operation and more!



From Daiwa At Your Favorite Dealer... See What You've Been Missing!

EDCO Electronic Distributors Co. • 325 Mill St. • Vienna VA 22180
•Ph.703-938-8105 •FAX 703-938-6911
Call Your Dealer Today!
EDCO

OWNERSHIP STATEMENT

Statement of Ownership, Management and Circulation
(Required by 39 U.S.C. 3685)

1A. Title of Publication	1B. PUBLICATION NO.	2. Date of Filing
73 AMATEUR RADIO TODAY	1 0 5 2 - 2 5 2 2	9/27/93
3. Frequency of Issue	3A. No. of Issues Published Annually	3B. Annual Subscription Price
Monthly	12	$29.97

4. Complete Mailing Address of Known Office of Publication (Not printer). (Street, City, County, State and ZIP+4 Code) (Not printer)
70 Route 202 North, Peterborough, Hillsborough Cty, NH 03458-1107

5. Complete Mailing Address of the Headquarters of General Business Offices of the Publisher (Not printer)
70 Route 202 North, Peterborough NH 03458-1107

6. Full Names and Complete Mailing Address of Publisher, Editor, and Managing Editor (*This item MUST NOT be blank*)
Publisher (Name and Complete Mailing Address)
Wayne Green, 70 Route 202 North, Peterborough NH 03458-1107
Editor (Name and Complete Mailing Address)
Wayne Green, 70 Route 202 North, Peterborough NH 03458-1107
Managing Editor (Name and Complete Mailing Address)
Hope Currier, 70 Route 202 North, Peterborough NH 03458

7. Owner (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.) (Item must be completed.)

Full Name	Complete Mailing Address
Wayne Green Inc	70 Route 202 North, Peterborough NH 03458
Wayne Green	70 Route 202 North, Peterborough NH 03458

8. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages or Other Securities. (If there are none, so state.)

Full Name	Complete Mailing Address
None	

9. For Completion by Nonprofit Organizations Authorized To Mail at Special Rates (DMM Section 424.12 only)
The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes: (Check one)
(1) ☐ Has Not Changed During Preceding 12 Months (2) ☐ Has Changed During Preceding 12 Months (If changed, publisher must submit explanation of change with this statement.)

10. Extent and Nature of Circulation (See instructions on reverse side)	Average No. Copies Each Issue During Preceding 12 Months	Actual No. Copies of Single Issue Published Nearest to Filing Date
A. Total No. Copies (Net Press Run)	78,766	76,584
B. Paid and/or Requested Circulation 1. Sales through dealers and carriers, street vendors and counter sales	47,121	46,146
2. Mail Subscription (Paid and/or requested)	28,586	28,572
C. Total Paid and/or Requested Circulation (Sum of 10B1 and 10B2)	48,655	47,722
D. Free Distribution by Mail, Carrier or Other Means Samples, Complimentary, and Other Free Copies	657	638
E. Total Distribution (Sum of C and D)	49,312	48,360
F. Copies Not Distributed 1. Office use, left over, unaccounted, spoiled after printing	2,402	1,228
2. Return from News Agents	27,052	26,996
G. TOTAL (Sum of E, F1 and 2 - should equal net press run shown in A)	78,766	76,584

11. I certify that the statements made by me above are correct and complete

12. Signature and Title of Editor, Publisher, Business Manager, or Owner
David Shively Assoc Publisher
(See instructions on reverse)

PS Form 3526, January 1991

CAT-300 Repeater Controller

Attention Repeater Owners

Finally a repeater controller with a TI voice synthesizer and full feature autopatch incredibly priced at $299.00.

Features Include:

- ✓ *Voice Synthesizer*
- ✓ *Twelve Voice Messages*
- ✓ *Two Voice Identifiers*
- ✓ *Full Feature Autopatch*
- ✓ *User Speed Dials*
- ✓ *DTMF Key Pad Test*
- ✓ *DTMF Repeater Access*
- ✓ *(56) Control Functions*
- ✓ *Remote Control Switches*
- ✓ *DVR Controller Ready **
- ✓ *(412) Word Vocabulary*
- ✓ *Female Voice & Sound Effects*
- ✓ *CW Identifier*
- ✓ *Reverse Autopatch*
- ✓ *Emergency Speed Dials*
- ✓ *Programmable Courtesy Tones*
- ✓ *DTMF Repeater Muting*
- ✓ *Programmable Codes and Timers*
- ✓ *Hardware Logic Inputs*

** (Requires MF-1000 Serial Interface Card $59.00)*

Write or Call for a brochure describing the CAT-300 Controller, including schematic, voice word list, and control functions.

CAT-300 Controller Board $299.00 Wired and Tested

Computer Automation Technology, Inc.
4631 N.W. 31st Avenue, Suite 142,
Fort Lauderdale, Florida 33309
(305) 978-6171

CIRCLE 268 ON READER SERVICE CARD

QRP

Number 18 on your Feedback card

Low Power Operation

Michael Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

[Editor's Note: Observant readers of this column noticed last month's material was a repeat of the column originally printed in June 1992. We don't know how this happened. Michael passed in a new column but we somehow substituted an old one. We apologize to Michael and to his loyal readers.—Ed.]

Back to the Future

A transmitter's output must be as clean as possible. Just because it only produces 5 watts of output is no excuse for a dirty signal. That's the purpose of the output filter—to make sure the signal is clean. This month, I'll show you how to design an output filter for your latest creation.

Of course, the reason we need an output filter in the first place is simple: A transistor amplifier generates buckets full of harmonics. Without a properly designed filter, these harmonics would cause all sorts of problems to other stations and even other services. Unfiltered transmitters can produce interference to devices not in the amateur bands, such as your neighbor's TV, stereo, toaster, and so on. Never place a transmitter on the air without a harmonic filter!

The Output Filter

So then, the purpose of an output filter is to keep unwanted harmonics from ever reaching the antenna. We do this by designing a filter to *cut off* at a frequency just above the one we want to keep. In a 40 meter transmitter, the operating frequency is 7 MHz, of course. A good cutoff frequency for our output filter would be just above 7 MHz. Most output filters for the 40 meter band have a cutoff frequency of 8 MHz. Some may be lower, some may be a bit higher, but all will be around this range.

Frequencies under 8 MHz will be allowed to pass to the antenna. Those above the cutoff frequency will be attenuated. Depending on the type of filter, this attenuation may be as great as 60 dB. The amount of attenuation required is based on the amount of RF power too. A 5 watt transmitter is allowed a greater amount of harmonics than a transmitter running 100 watts. Get your rule book out and you'll see that transmitters under 5 watts are to have their harmonic contents under 30 dB down. A 100 watt transmitter must have its harmonic contents reduced to 40 dB down from the fundamental frequency. In either case, the larger the number in terms of dB, the better the filter works.

The amount of attenuation required will determine the type of filter required. In many simple QRP transmitters, a single coil and two capacitors comprise the output filter. The more sections you have in the filter's design, the better the filter. The amount of attenuation is measured as ripple. The less ripple, the better the filter. Ripple is measured in dB.

The Coils

In today's filter circuits the coils are almost entirely wound on toroid cores. Not only is a toroid self-shielding, it also allows a large amount of inductance in a very small package. You would be hard pressed to find a output filter in today's equipment not using some sort of toroid cores.

In filter design, we need to know several fundamental items: cutoff frequency, core type, input and output impedance, power handling capacity, and physical size.

Given a cutoff frequency in MHz, we need to first find the proper core to use in our output filter. This is best done by looking up the core's characteristics on a chart or table. You can get one of these tables from any of the companies selling cores. The *ARRL Handbook* is also a good source.

As a good rule of thumb, a type 2 core is good from 80 meters to about 30 meters. Above 30 meters, a type 6 core is a good choice. I've seen some applications where a type 2 core was used for 20 meters and type 6 material on 30 meters.

Don't be duped into thinking the color of the core is etched in glass. I've been bitten by this bug before. Just because the core is yellow, don't assume it is type 6 material. Be especially careful of hamfest or surplus toroid cores. A mislabeled core in your next rig could be a hard problem to track down.

The amount of inductance required will also dictate the required core. There are two more factors that need to be addressed: wire size and, to a certain extent, output power.

I have found that wire size has little to do with the final inductance of a coil wound on a core. Before I get hate mail from Mike WA8, let me say most hams don't have the specialized equipment to measure the exact inductance of a homemade coil. If the plans call for 24 turns of number 26 gauge wire but all you have in your junk box is 24 gauge, then use it. You won't be able to tell any difference in the final output of your project.

On the other hand, if the coil needs to be wound with six turns of number 12 gauge wire, you can't really substitute six turns of number 22 gauge wire either. Most high-power (high-current) applications will require a thicker gauge of wire to handle the current flow, be it RF or DC. The core size and type will also have to be determined to handle the power at the required inductance. A larger core will be required to hold larger wire to get the same amount of turns required.

Inductance Values

Output filters of 0.01 dB of ripple have become somewhat standard with QRP transmitters. A better filter would have 0.1 dB of ripple. You'll see about a two percent loss in power, but you'll gain a 10 dB improvement in attenuation.

The desired filter frequency will be: Fc = Fo (1.15). Use 7.2 MHz for Fo: Fc = 7.2 x 1.15 = 8.25 MHz. The filter cutoff frequency (Fc) is 8.25 MHz.

From the chart, for a 0.1 dB ripple, seven-pole filter, the value for L1 is 11.32. So, L1 - L3 = 11.32 / 8.25 = 1.35 µH.

From the same chart, the value for L2 = 12.52. So . . . L2 = 12.52 / 8.25 = 1.15 µH.

This tells us the required amount of inductance for each of the coils in our transmitter. The number of turns will be calculated next, but first we have to see what type of core we'll use.

I happen to have a handful of T-50-2 cores, so that's what I'll use. According to the table supplied by Amidon, a 2 mix core is good from 1 to 30 MHz. This same table provides us with an important factor required for calculating the number of turns: the AL value. This tells you the µH per 100 turns of wire on the core. The AL value for the T-50-2 core is 50.

So, turns required =

$$100 \sqrt{\frac{\text{desired L (µH)}}{\text{AL value.}}}$$

$$L1 - L3 = 100 \sqrt{\frac{1.35}{50.}}$$

L1 and L3 require 16 turns of wire.

$$L2 = 100 \sqrt{\frac{1.15}{50.}}$$

L2 requires 15 turns of wire.

Capacitor Values

This takes care of the coils. Now for the capacitors required in the filter. Again from the table, C1 and C4 = 3759.8. C1 - C4 = 3759.8 / 8.28. C1 and C4 are 454 pF; use the standard value of 470 pF.

C2 - C3 = 6673.9 / 8.28. C2 and C3 are 806 pF; use the next standard value of 820 pF.

By using the information available to us, we can calculate the values required to keep our transmitters clean. Give the old calculator a try and create your own QRP machine. 73

BATTERIES
Nickel-Cadmium, Alkaline, Lithium, Sealed Lead Acid For Radios, Computers, Etc. And All Portable Equipment
YOU NEED BATTERIES? WE'VE GOT BATTERIES!
CALL US FOR FREE CATALOG
E.H.YOST & CO.
7344 TETIVA RD.
SAUK CITY, WI 53583
(608) 643-3194
FAX 608-643-4439
CIRCLE 114 ON READER SERVICE CARD

VECTOR FINDER
ZERO-IN THE SIGNAL!
HAND-HELD PHASE SENSE ANTENNAS FOR VHF DIRECTION FINDING. USES ANY FM XCVR. COMPASS GIVES DIRECTION. ARMS FOLD FOR STORAGE. TYPE VF-142 COVERS BOTH 2-MTRS & 220MHZ. OTHER MODELS AVAILABLE. WRITE OR CALL FOR MORE INFO.
$3.50 SHIPPING & CA. ADD TAX)
TYPE VF-142 $139.95
619-565-1319
RADIO ENGINEERS
3941 MT. BRUNDAGE AVE.
SAN DIEGO CA.92111
CIRCLE 58 ON READER SERVICE CARD

BayCom Modem
Low Cost Packet for PC / Clones
Features: Software-based PACKET that makes your computer emulate a TNC. Modem connects from serial port to RIG. Watchdog timer & reed relay PTT standard. Operates from 12VDC@100ma, wall power supply included. Uses crystal controlled 7910 chip, VHF and HF. Lock & TX LED indicators. Free copy of Version 1.40 English software included.
Kit.....$59.95 Enclosure $10
Assembled & Tested Board $79.95
Assembled & Tested in Box $89.95
CA Residents add 7.75% sales tax. S&H: $5.00 (insured). Foreign orders add 20%. For more info or catalog; send legal size SASE (52¢) to:
A&A Engineering
2521 W. LaPalma #K • Anaheim, CA 92801 • 714-952-2114

W9GR DSP FILTER

11 Switch Selectable Filters in One

Just turn the switch to select one of:
4 Filters which enhance **SSB signals** by reducing hiss, static, ignition, and powerline noise with no perceptible time delay combined with **Multiple Automatic Notch** filters to remove heterodynes instantly.
4 "Brick-wall" CW Filters with bandwidths of 50 Hz to 200 Hz.
3 unique linear phase bandpass filters for **RTTY, HF Packet,** and **SSTV.**

Installs easily between the receiver and external speaker or headphones.

W9GR DSP Filter **$299.95**
12 VDC Power Supply **$11.95**
Shipping and Handling US $5, overseas $15

VISA | 30 day money back guarantee. 90 day parts & labor warranty. | MasterCard

j-Com · 793 Canning Pkwy · Victor NY 14564
(716) 924-0422 · FAX (716) 924-4555

CIRCLE 175 ON READER SERVICE CARD

The Best Value

TWO METERS!

MAX System ™ *Antennas*

Ground Plane	25.95
3 Element Quad	39.95
5 Element Quad	59.95

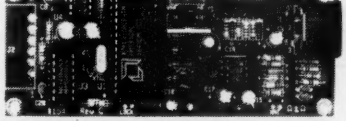
1-800-487-7539 ORDERS
Master Card & VISA Accepted

508-281-8892 INFO
508-768-7486 FAX
US Shipping $4.00
MA add 5%

Send Orders To: Cellular Security Group
4 Gerring Road
Gloucester, MA 01930

DigiCom > 64 Modem

Low Cost Packet for the Commodore



Features: Software-based PACKET that makes your computer emulate a TNC. Modem connects from cassette port to RIG. Watchdog timer & reed relay PTT standard. Power derived from Computer. Uses crystal controlled 7910 chip, VHF and HF. Lock, TX & RX LEDs. Free copy of Version 2.03 software included.

Complete Kit Only $49.95
Assembled & Tested $69.95

CA Residents add 7.75% sales tax. S&H: $5.00 (insured). Foreign orders add 20%. For more info or price list; send legal size SASE (52¢) to:

MasterCard | ***A&A Engineering*** | VISA

2521 W. LaPalma #K • Anaheim, CA 92801 • 714-952-2114

TEJAS KITS™

now offers over 30 different products, many (until now) hard-to-find parts, plus we're announcing more *new* kits just in time for Christmas! Do you have a local ***TEJAS KIT*** dealer? **TEJAS RF** has a new ***TEJAS KIT AUTHORIZED DEALER PROGRAM!*** Send us both your name and your LOCAL DEALERS name. We'll send you both a FREE new ***TEJAS KIT*** Catalog! And we'll send your local dealer an ***AUTHORIZED DEALER KIT,*** too.

TEJAS RF TECHNOLOGY
P.O. BOX 720331
HOUSTON, TEXAS 77272-0331
FAX (713) 879-9494 PHONE (713) 879-9300

Sell your product in ***73 Amateur Radio Today***
Call Dan Harper today. . . **1-800-274-7373**

24 HOUR SHIPPING — **ELENCO • HITACHI • B&K PRODUCTS** — **GUARANTEED LOWEST PRICES**

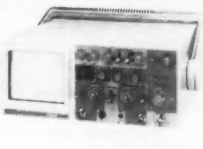
TO ORDER CALL TOLL FREE
1-800-292-7711
1-800-445-3201 (Can.)

AFFORDABLE - HIGH QUALITY
2 YEAR WARRANTY

STANDARD SERIES
S-1325 25MHz $349
S-1340 40MHz $495
S-1365 60MHz $849

Features:
- High Luminance 6" CRT
- TV Sync
- 1mV Sensitivity
- 2 - x1, x10 Probes
- X-Y Operation
- Complete Schematic
- Voltage, Time, + Frequency differences displayed on CRT thru the use of cursors (S-1365 only)
- Plus much, much more

ELENCO OSCILLOSCOPES



DELUXE SERIES
S-1330 25MHz $449
S-1345 40MHz $575
S-1360 60MHz $775

Features:
- Delayed Sweep
- Dual time base
- Automatic Beam Finder
- Illuminated internal gradicule
- Z Axis Modulation
- Built-in Component Test
- Plus all the features of the "affordable" series

Hitachi Compact Series Scopes

V-212 - 20MHz Dual Trace	$399
V-525 - 50MHz, Cursors	$995
V-523 - 50MHz, Delayed Sweep	$949
V-522 - 50MHz, DC Offset	$895
V-422 - 40MHz, DC Offset	$795
V-222 - 20MHz, DC Offset	$649
V-660 - 60MHz, Dual Trace	$1,149
V-665A - 60MHz, DT, w/cursor	$1,325
V-1060 - 100MHz, Dual Trace	$1,395
V-1065A - 100MHz, DT, w/cursor	$1,649
V-1085 - 100MHz, QT, w/cursor	$1,995
V-1100A - 100MHz, Quad Trace	$2,495
V-1150 - 150MHz, Quad Trace	$2,395

B&K OSCILLOSCOPES

2120 - 20MHz Dual Trace	$389
2125 - 20MHz Delayed Sweep	$539
1541B - 40MHz Dual Trace	$695
2160 - 60MHz Dual Trace, Delayed Sweep, Dual Time Base	$949
2190 - 100MHz Three Trace Dual Time Base, Delayed Sweep	$1,395
2522A - 20MHz / 20MS/s Storage	$875

Digital Capacitance Meter
CM-1550B by Elenco
$58.95
9 Ranges
1pf-20,000ufd
5% basic accy.
Big 1" Display — Zero control w/ Case

Digital LCR Meter
LC-1801
$125
Measures:
Coils 1uH-200H
Caps 1pf-200uf
Res .01-20M
Big 1" Display — by Elenco

Digital Multimeter
DVM-635
$39.95
11 Functions with Case

FLUKE MULTIMETERS

Scopemeters		(All Models Available Call)	
Model 93	$1,225.00	**70 Series**	
Model 95	$1,549.00	Model 70II	$65.00
Model 97	$1,785.00	Model 77II	$149.00
10 Series		Model 79II	$169.00
Model 10	$62.95	**80 Series**	
Model 12	$79.95	Model 87	$289.00

Digital Triple Power Supply
Elenco XP-765
$289
0-20V @ 1A
0-20V @ 1A
5V @ 5A
Fully regulated, Short circuit protected with 2 limit control, 3 separate supplies — XP-660 with Analog Meters $195

Video Head Tester
Elenco HT-200
$44.95
Tells you if VHS head is defective or worn

Digital Multimeter w/ Inductance & Capacitance
$75.00
LCM-1850
Ten Functions
by Elenco

Color Convergence Generator
Elenco SG-250
$89.95
Kit $69.95
Finest in the industry
10 rock steady patterns
RF & video output

Sweep/Function Generator with Freq. Counter
$239
Elenco
Model GF-8026
Sine, Square, Triangle, Pulse, Ramp
2 to 2MHz, Freq Counter 1-10MHz
Internal Linear & Logic Sweep

Function Generator Blox
#9600
by Elenco
$28.95
Kit $26.95
Provides sine, triangle, square wave from 1Hz to 1MHz
AM or FM capability

XK-500 Digital / Analog Trainer

A complete mini-lab for building, testing, prototyping analog and digital circuits
Elenco's Digital/Analog Trainer is specially designed for school projects with 5 built-in power supplies. Includes a function generator with continously variable sine, triangular, square wave forms. All power supplies are regulated and protected against shorts.

Power Supplies
- Variable Power Supply
- +1.25 to 20VDC @ 5 Amp
- +1.25 to 15VDC @ 1 Amp
- ±1.25 to 20VDC @ 5 Amp
- ±1.25 to 15VDC @ 1 Amp
- +12VDC @ 1 Amp
- -12VDC @ 1 Amp
- +5VDC @ 1 Amp
- 30VAC Center-tapped @ 1.5VAC at 1 Amp

Analog - Section
- Function Generator Sine, Triangular, Square wave forms
- Frequency adjustable in five ranges from 1 Hz to 100KHz
- Fine frequency adjust
- Amplitude adjust
- DC offset
- Modulation FM/AM

Digital - Section
- Eight data switches
- Two no bounce logic switches
- 8 - LED readouts TTL buffered
- Clock frequency 1 Hz to 100KHz
- Clock amplitude 5VPP square wave

Breadboards — $159.95 Assembled — $129.95 Kit
- 2 breadboards each contain 840 tie points, total 1,680

Learn to Build and Program Computers with this Kit
Includes: All Parts, Assembly and Lesson Manual
Model
MM-8000
$129.00
by Elenco
Starting from scratch you build a complete system. Our Micro-Master trainer teaches you to write into RAMs, ROMs and run a 8085 microprocessor, which uses similar machine language as IBM PC

Elenco Wide Band Signal Generators
SG-9000 **$119**
RF Freq 100K-450MHz AM Modulation of 1KHz Variable RF output
SG-9500 w/ Digital Display & 150MHz built-in counter $239

WE WILL NOT BE UNDERSOLD
UPS SHIPPING: 48 STATES 3% OTHERS CALL
IL RES add 7.75% TAX
PROBES INCL. ALL SCOPES & METERS

C&S SALES INC.
1245 ROSEWOOD, DEERFIELD, IL 60015
FAX: 708-520-0085 • (708) 541-0710

VISA | MasterCard

15 DAY MONEY BACK GUARANTEE
FULL FACTORY WARRANTY
WRITE FOR FREE CATALOG

CIRCLE 184 ON READER SERVICE CARD

PACKET & COMPUTERS

Digital Amateur Radio

Jeffrey Sloman N1EWO
P.O. Box 636
Franklin IN 46131

Getting Started with TCP/IP, Part 3

Wow! I guess you ARE interested in getting a TCP/IP station on the air. At least that is the way it looks from here. I have received *hundreds* of email requests for information about software and IP addresses. My Internet mailbox overflowed, so I lost some of the queries, and I just couldn't possibly answer all those requests—not enough time in the day. So, I'll do the best I can, and try to clear up the confusion that a transposition of letters caused in the first installment of this series, and give you the best information that I have about IP address coordinators.

In the first column I told you to get a copy of JNOS version 1.08c from USCD.EDU via anonymous FTP. Well, forget that. Here is the CORRECT information:

Location: UCSD.EDU (note the correction from USCD.EDU)

Directory: hamradio/packet/tcpip/wg7j

Filename: JNOS107B.EXE

Those of you who have managed to get later versions of JNOS, this is fine. The choice of 1.07b is based on its stability and availability, but later versions will work. Keep this in mind because this version is available in the directory noted above. The 1.07b version will be available on the *73* BBS, in the "Packet and Computers" area (8). You can reach the *73* BBS at (603) 924-9343, 2400 baud, 8N1. Note that this is a relatively large file and the slow speed of the *73* BBS should convince you to try other places first.

Uncoordinated Coordination

I thought most of you would be able to find your local AMPR coordinator, though I expected a few requests for help. Well, after receiving hundreds of messages via Internet mail, I realized that maybe some of you were having some trouble. I have to do something, but answering each of your cries for help is not a practical route. So, here (in the sidebar) is the list of the official volunteer AMPR coordinators. THIS IS ALL THE INFORMATION THAT I HAVE. I cannot tell you how to contact these people or exactly which one is the coordinator for your location.

Look on the list and take your best shot. It has been sorted by location, to make it easier for you. Also, the last column is the *subnet* for the coordinator's area. This can also be a clue for you. Find someone with an IP address and look for the matching subnet. Remember that these people are volunteers—please be friendly and courteous with your request. If you think that you might want to run more than one station, request more than one address. Though the specific information that the coordinator will need may vary from place to place, if you contact them via packet radio, try to include at least the stuff below to decrease your chance of being asked to provide more information:

Your name.
Your call.
A mailing address.
A phone number.

The county, town or city, and zip code where the station will be located.

You may have to wait a little while for a reply, try to be patient. If you want to get started, but don't yet have an address, you can use the official "test" network. This is any address in the 44.128.XXX.XXX range.

An Important Note About Packet Radio

While I always enjoy corresponding with you via packet radio, I simply cannot do business that way. Because I do not want to have even the appearance of impropriety, I just cannot answer any mail that refers to the column and then asks for help. Please, if you need help, use commercial email or paper mail. I can be reached on the Internet:

jsloman@bix.com

and by US mail:

N1EWO
P.O. BOX 636
Franklin IN 46131

Thanks for your understanding. Note, too, that I still want to hear from you on the amateur packet network. Please, just restrict this traffic to pleasantries or questions that relate to ham stuff with no reference to the column.

More Than Error Correction

Though I had planned to get started on the tutorial this month, I had to clear up the confusion caused by typos and whatnot. Now I don't want to completely frustrate those of you who have managed to get the software and an IP address, so let's take what space is left to at least begin the tutorial. (Next month will be dedicated to the tutorial.)

JNOS and Its Files

The heart of making JNOS work is a set of text files that configure the program and provide information to it. Though they all must be in good shape for things to work, the central focus is on a configuration file called AUTOEXEC.NOS. Like a combination of DOS' CONFIG.SYS and AUTOEXEC.BAT, AUTOEXEC.NOS contains hardware and software configuration information and commands for the program to carry out on startup. It is the arcane and not-so-logical stuff in this file that will make or break your station.

Unfortunately, the exact format and syntax of AUTOEXEC.NOS varies not only among implementations of NOS, but even among versions of the SAME implementation. To get you started with JNOS, we'll look at one of the most confusing and absolutely required sections of AUTOEXEC.NOS as it works with JNOS (and most other NOSs, thank goodness).

The section is reproduced here in Figure 1. These are the statement(s) that attach the communication device(s) to the program. Our example here is to connect a TNC to a comm port. Later on we'll look at more advanced stuff like Ethernet.

Any of the lines that begin with "#" are comments, and shown are lines for all four comm ports. The active one is com1, since it is not preceded by "#."

The attach command instructs the program to connect a hardware device to the program. The parameter "asy" is an abbreviation for "asynchronous," the type of communications device. The next value "0x3f8" is the base address of the communications port, you probably don't need to change the values from the standard ones listed here. Following the base address is the IRQ (interrupt). This is also a standard value for each port. The next parameter, "AX25," tells JNOS what sort of interface this will be. There are other values which we will discuss later.

The value "tnc0" is an arbitrary name that is used to refer to the interface you are creating. This name can be nearly anything, and should probably NOT be tnc0. Many users name it by frequency—01, 03, 05, etc.—to make it easier to understand what is going on. If your station will not necessarily stay on one frequency, name it anything that seems meaningful to you.

The next two numbers are buffers; don't change these until you know more. This is another advanced topic which we will discuss. The last number is the baud rate of the port. Note that it is set to 4800 here. Why? Because the program may have difficulty decoding the information from the TNC if it comes at a higher rate, but the messages from the TNC will seem intolerably slow at 1200 or 2400. This is a good compromise. One way to tell if you have the port speed set too high is the presence of corrupted or "nonsense" calls in the "just heard" list.

Keep It Simple, Stupid

The other absolute requirement for NOS to operate is that the TNC be made to operate in KISS (Keep It Simple, Stupid) mode. In this mode, JNOS takes over the operation of the TNC. There is a small script included as part of the AUTOEXEC.NOS that is designed to turn your TNC's KISS mode on (most TNC command sets require a simple "KISS ON" com-

```
                # ————————ATTACH THE TNC————————
  attach asy     0x3f8 4 ax25 tnc0 2048 256 4800     # COM1
# attach asy     0x2f8 3 ax25 tnc0 2048 256 4800     # COM2
# attach asy     0x3e8 4 ax25 tnc0 2048 256 4800     # COM3
# attach asy     0x2e8 3 ax25 tnc0 2048 256 4800     # COM4
```

Figure 1. One of the critical sections of AUTOEXEC.NOS.

Quality Microwave TV Antennas
WIRELESS CABLE - IFTS - MMDS - Amateur TV
Ultra High Gain 50db(+) • Tuneable 1.9 to 2.7 Ghz.
• 55-Channel Dish System $199.95
• 36-Channel Dish System $149.95
• 20-Channel Dish System $124.95
• Optional Commercial Grid Antenna (not shown) Add $50.00
• Yagi Antennas, Components, Custom Tuning Available
• Call or write (SASE) for "FREE" Catalog
PHILLIPS-TECH ELECTRONICS
Dish System P.O. Box 8533 • Scottsdale, AZ 85252
LIFETIME WARRANTY (602) 947-7700 ($3.00 Credit all phone orders)
MasterCard • Visa • American Express • COD's • Quantity Pricing
CIRCLE 249 ON READER SERVICE CARD

CornerBeam?
SWR < 1.2:1 across the band
Gain of a 15 ft Yagi
No dimension over 7 ft
40 dB Front-to Back Ratio
60° Half-power Beamwidth
Mounts directly to mast
Vertical or Horizontal Polarization
2meters $145, 220 MHz $145, 70 cm $115, Dual 146/440 $165
Weighs only 10 lbs. Add $11 Shipping & Handling. Info $1.
AntennasWest
Box 50062 Provo UT 84605
Order HotLine
801 373 8425
CIRCLE 380 ON READER SERVICE CARD

ULTIMATE MODIFICATION BIBLE
MOST COMPLETE, GREATEST IN IT'S TIME !!!
OVER 800 MIKE WIRINGS CB, HAM.
OVER 400 CB POWER MODIFICATIONS.
OVER 200 CB CHANNEL MODIFICATIONS.
OVER 125 MOD. HAM RADIOS.
OVER 50 COMPLETE CRYSTAL CHARTS.
OVER 20 MOD. CRYSTAL CHARTS.
OVER 15 SCANNER MOD.
TEN METER RADIO MOD.
LINEAR/COAX/ANT. INFO.
OVER 200 PAGES OF INFO.
KDC SOUND 1-800-256-9895
5 PINE MEADOW $ 29.95
CONROE, TX 77302
CIRCLE 151 ON READER SERVICE CARD

AMPR NETWORK VOLUNTEER COORDINATOR LIST

Region/Country	Coordinator	Callsign	Subnet
Calif: Sacramento	Bob Meyer	K6RTV	44.002
Calif: Silicon Valley-San Francisco	Douglas Thom	N6OYU	44.004
Calif: Santa Barbara/Ventura	Don Jacob	WB5EKU	44.006
Calif: San Diego	Brian Kantor	WB6CYT	44.008
Calif: Orange County	Terry Neal	AA6TN	44.01
"Eastern Washington, Idaho"	Steven King	KD7RO	44.012
Hawaii & Pacific Islands	John Shalamskas	KJ9U	44.014
Calif: Los Angeles-S F Valley	Jeff Angus	WA6FWI	44.016
Calif: Antelope Valley/Kern County	Dana Myers	KK6JQ	44.017
Calif: San Bernardino & Riverside	Geoffrey Joy	KE6QH	44.018
Colorado: Northeast	Fred Schneider	KØYUM	44.02
Alaska	John Stannard	KL7JL	44.022
Washington state: Western (Puget Sound)	Dennis Goodwin	KB7DZ	44.024
Oregon	Ron Henderson	WA7TAS	44.026
Texas: North	Don Adkins	KD5QN	44.028
New Mexico	J. Gary Bender	WS5N	44.03
Colorado: Southeast	Bdale Garbee	N3EUA	44.032
Tennesee	Mark J. Bailey	N4XHX	44.034
Georgia	Doug Drye	KD4NC	44.036
South Carolina	Mike Abbott	N4QXV	44.038
Utah	Matt Simmons	KG7MH	44.04
Mississippi	Phil Akers	WA4DDE	44.042
Massachusetts: Western	Bob Wilson	KA1XN	44.044
Missouri	William Simmons	WBØROT	44.046
Indiana	Jacques Kubley	KA9FJS	44.048
Iowa	Ron Breitwisch	KCØOX	44.05
New Hampshire	Gary Grebus	K8LT	44.052
Vermont	Ralph Stetson	KD1R	44.054
Eastern & Central Mass.	Don Hughes	KA1MF	44.056
West Virginia	Rich Clemens	KB8AOB	44.058
Maryland	Howard Leadmon	WB3FFV	44.06
Virginia	Jim DeArras	WA4ONG	44.062
Virginia (Charlottesville Area)	Jon Gefaell	KD4CQY	44.062
New Jersey: Northern	Dave Trulli	NN2Z	44.064
New Jersey: Southern	Bob Applegate	WA2ZZX	44.065
Delaware	John DeGood	NU3E	44.066
New York: NYC & Long Island	Bob Foxworth	K2EUH	44.068.1-32
New York: ENY	Bob Bellini	N2IGU	44.068.64+
New York: WNY	Paul Gerwitz	WA2WPI	44.069
Ohio	Gary Sanders	N8EMR	44.07
Chicago-North Ill.	Ken Stritzel	WA9AEK	44.072
South/Central Ill.	Chuck Henderson	WB9UUS	44.073
North Carolina (East)	James Curran	KA4OJN	44.074
North Carolina (West)	Charles Layno	WB4WOR	44.075
Texas: South	Kurt Freiberger	WB5BBW	44.076
Texas: West	Rod Huckabay	KA5EJX	44.077
Oklahoma	Joe Buswell	K5JB	44.078
Pennsylvania: Eastern	Doug Crompton	WA3DSP	44.08
MontanaSteven Elwood	N7GXP	44.082	
Colorado: Western	Bob Ludtke	K9MWM	44.084
Wyoming	Reid Fletcher	WB7CJO	44.086
Connecticut	Jon Bloom	KE3Z	44.088
Nebraska	Mike Nickolaus	NFØN	44.09
"Wisconsin, Upper Peninsula Michigan"	Pat Davis	KD9UU	44.092
Minnesota	Gary Sharp	WDØHEB	44.094
(Minn-Twin Cities area only)	Andy Warner	NØREN	—
District of Columbia	Don Bennett	K4NGC	44.096
Florida	Bruce La Pointe	WD4HIM	44.098
Alabama	Richard Elling	KB4HB	44.1
Michigan (Lower Peninsula)	Jeff King	WB8WKA	44.102
Rhode Island	Charles Greene	W1CG	44.104
Kentucky	Tyler Barnett	N4TY	44.106
Louisiana	James Dugal	N5KNX	44.108
Arkansas	Richard Duncan	WD5B	44.11
Pennsylvania: Western	Bob Hoffman	N3CVL	44.112
N&S Dakota	Steven Elwood	N7GXP	44.114
"Oregon: NW & Portland, Vancouver WA"	Tom Kloos	WS7S	44.116
Maine	Carl Ingerson	N1DXM	44.118
	unassigned		44.12
Kansas	Dale Puckett	KØHYD	44.122
Arizona	David Dodell	WB7TPY	44.124
Southern Nevada	Earl Petersen	KF7TI	44.125.0-126
Northern Nevada	Bill Healy	N8KHN	44.125.128-254
Puerto Rico	Karl Wagner	KP4QG	44.126
	TEST		44.128
"Tak Kushida, JH3XCU Joly Kanbayashi"	Japan	JG1SLY	44.129
Ralf D. Kloth	Germany	DL4TA	44.13
Paul Taylor	United Kingdom	G1PLT	44.131
Robby Soebiakto	Indonesia	YB1BG	44.132
Jose Antonio Garcia. Madrid. (EA4DQX @ EA4DQX)	Spain	EA4DQX	44.133
	Italy	I2KFX	44.134
Barry McLarnon	Canada	VE3JF	44.135
John Tanner	Australia	VK2ZXQ	44.136
Gerard Van Der Grinten	Netherlands	PAØGRI	44.137
Peleg Lapid	Israel	4X1GP	44.138
Matti Aarnio	Finland	OH1MQK	44.139
Lennart	Sweden	SMØIES	44.14
Per Eftang	Norway	LA4JL	44.141
Marco Zollinger	Switzerland	HB9CAT	44.142
Krzysztof Dabrowski	Austria	OE1KDA	44.143
	Belgium	ON7LE	44.144
	Denmark	OZ1EUI	44.145
Eddie Manolo	Phillipines	DU1UJ	44.146
Wayne Knowles	New Zealand	ZL2BKC	44.147
Ted	Ecuador	HC5K	44.148
Thomason FAN	Hong Kong	VS6YHJ	44.149
Iztok Saje	Slovenija	S53FK	44.15
Pierre-Francois Monet	France	FC1BQP	44.151
Luis Suarez	Venezuela	OA4KO/YV5	44.152
Pedro Converso	Argentina	LU7ABF	44.153
Demetre Valaris	Greece	SV1UY	44.154
Paul Healy	Ireland	EI9GL	44.155
Bela Markus	Hungary	HA5DI	44.156
Raul Burgos	Chile	CE6EZB	44.157
Artur Gomes	Portugal	CT1DIA	44.158
Kunchit Charmaraman	Thailand	HS1JC	44.159
John	South Africa	ZS6BHD	44.16
Erny Tontlinger	Luxembourg	LX1YZ	44.161
C. Costis	Cyprus	5B4TX	44.162
Chuck Hast	Central America	TI3DJT	44.163
Otto Morroy	Surinam	PZ2AC	44.164
Andrzej K. Brandt	Poland	SP5WCA	44.165
	Korea	Unknown	44.166
"Lakshman (`Lucky') Bijanki"	India	VU2LBW	44.167
Bolon	Taiwan	BV5AF	44.168
Kunle	Nigeria	5NØOBA	44.169
Sinisa Novosel	Croatia	??	44.17
	Serbia	??	44.171
Ekendra	Sri Lanka	4S7EF	44.172
(no one has volunteered yet)	Mexico	XE??	44.173
Luiz F. Catalan	Brazil	PP5AQ	44.174
Jose Amador	Cuba	CO2JA	44.175
Abdul-Hamid Sadka	Turkey	TA2LA	44.176
Karel Odehnal	Czech Republic	OK2XTE	44.177
Karen Tadewosyan	Russia	RA3APW	44.178
Tom Clark	Outer Space	W3IWI	44.193

mand). We will cover this part of the file next month. In the meantime, if the TNC does not seem to initialize correctly try this: Talk to the TNC with any communications program, ensuring that the communications speed (baud rate) matches the one you chose in the AUTOEXEC.NOS. Check your manual for how to get your TNC into KISS mode. Send the command(s) and exit the program. Start NOS, and you should be all set.

Next time we'll get into more meaty stuff. Sorry for the confusion—I hope it's cleared up now. 'Til then 73 de N1EWO. 73

Bill Brown WB8ELK
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

Super Portable ATV Repeater

One night while I was visiting with Mike Henkoski KC6CCC, we decided to try to build a lightweight ATV repeater with a minimum number of components. The idea was to come up with a compact battery-operated system that could be easily transported (or even backpacked) to a remote site to act as a temporary relay during a special event or emergency. To test it out in the field we chose to launch it into the stratosphere with a weather balloon. From our planned maximum altitude of 100,000 feet we could potentially link up two ATV stations that were 800 miles apart (provided the repeater was midway between them).

The System

In order to eliminate the filtering and shielding required of an in-band repeater, we went with a crossband system that received on 915 MHz and transmitted on 434 MHz (see Figure 1). Mike KC6CCC designed a homebrew receiver taken from a commercial surveillance system that provided us with a complete receive board on 915 MHz that outputted video and audio directly. Note that you could also use a crystal-controlled receive board with a companion IF strip available from P.C. Electronics for this part of the repeater.

The transmitter consisted of a P.C. Electronics 80 milliwatt micro-ATV board (with companion subcarrier strip) which drove a PA5 power amplifier module. This combination gave us a 5 watt sync tip output while only drawing a little over 1 amp of current.

The repeater ID consisted of an Elktronics VDG-1 with an external timer. It would be better to go with a video-operated relay (eg: a VOR-2) instead of the timer, but we used what we had in the shack at the moment.

To keep the total repeater as light as possible, we used five D-cell lithium batteries (7.5 Ah). Although usually very pricey, we found a good source of very reasonably priced surplus lithium packs (10 D-cells) from S&G Photographic, telephone: (215) 474-7663. One pack should give you around 10 hours of operation (five hours using just five cells). Where weight is not critical, you will probably want to use a 5 Ah rechargeable gell-cell pack.

Mike KC6CCC built a pair of quadrifilar helix antennas (one for each band) for our flight test since we wanted a good pattern below the balloon repeater. For a hilltop or remote site, you will probably want to go with a linearly polarized omni or gain antenna system, depending on the area you want to link up.

Photo A. Mike KC6CCC, Mike WA6SVT, and Curt N6TWB fill three balloons to lift the ATV repeater.

The Flight Test

About 24 hours after tossing the potential repeater components into a big pile, we had the ATV repeater wired up and mounted in a lightweight styrofoam package. The modules were fastened to a piece of foamcore and surrounded with one-inch-thick styrofoam for insulation. We powered up the repeater and discovered that the transmitter section was badly overloading the receiver board. Fortunately, Mike Collis WA6SVT arrived on the scene and went to work bypassing the power leads while Mike KC6CCC shielded the receiver with copper foil. After spacing the antennas about five feet apart (the 434 MHz helix dangled below the payload), we finally came up with a fully functional crossband ATV repeater that performed well. The entire repeater (complete with batteries) weighed in at a mere six pounds!

We loaded everything up and headed for the hills above KC6CCC's house in San Clemente. We decided to launch the repeater with three small weather balloons. As Mike WA6SVT held onto the repeater, the balloons whipped about in a strong 10-15 knot wind. The possibility of crashing the repeater into the ground at takeoff was very real. Mike solved the problem by walking over to the edge of a cliff and tossing the re-

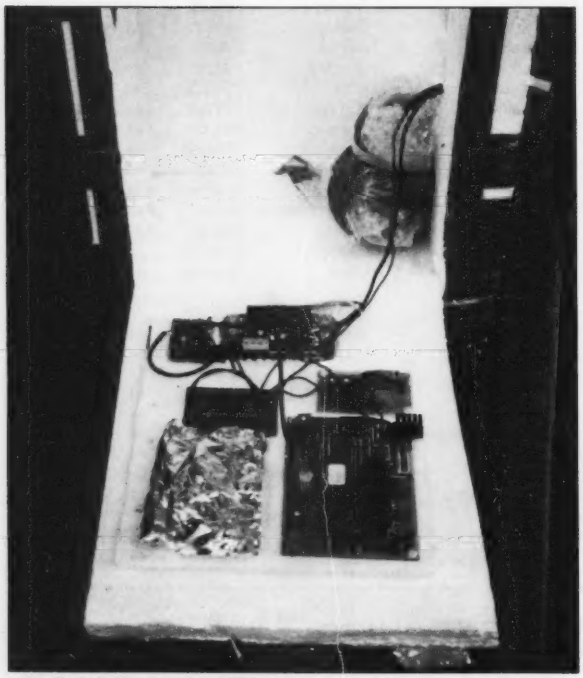


Photo B. The completed ATV repeater next to its styrofoam enclosure.

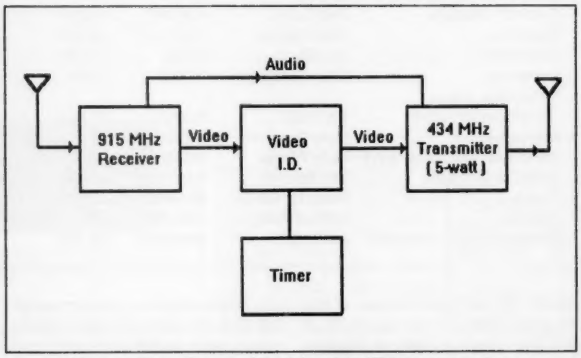


Figure 1. Block diagram of the lightweight ATV repeater system.

peater over the side! Just like taking off in a hang glider, the balloon repeater headed slowly off to the edge of space.

The 5 watt transmitter power provided most stations within 100 miles of the repeater with P5 color reception throughout the three-hour flight. Two stations in the area were capable of transmitting up to the repeater on 915 MHz during our flight test. We were able to send color video through the repeater from the launch site when we had our antennas oriented properly and Sam Lutweiler K6VLM could access the repeater with P2-P5 signal levels from his location in La Mirada (about 50 miles to the north). He could even repeat through the system using just 1 watt of uplink power.

It was such a clear day that we were able to see the balloons with binoculars and even observed two of them bursting at 72,000 feet. The repeater started descending with one balloon still intact and landed near the top of Mt. Elsinore near a dirt bike park.

Curt N6TWB and Jon N6ZYX Toumanian were chasing the repeater with DF gear and quickly spotted the remaining balloon bobbing above the repeater as it rested on a ridge about a mile ahead of them. As they rounded a curve and arrived at the landing site, they were surprised to see that the balloon and repeater had disappeared. They walked past some nearby pickup trucks at the dirt bike park and heard a strangely familiar beeping sound coming from the back of one of the trucks. It turned out that one of the dirt bikers, Tom Vetter, had beaten the chase team to the repeater and was about to call us for the reward! Although our wallets were a little thinner, we did recover the repeater. The repeater survived the flight in excellent condition and we hope to fly it again soon to test it out with different combinations of in and out frequencies. For example, a future flight may use 434 MHz in with either 919.25 or 1253.25 MHz as the output. 73

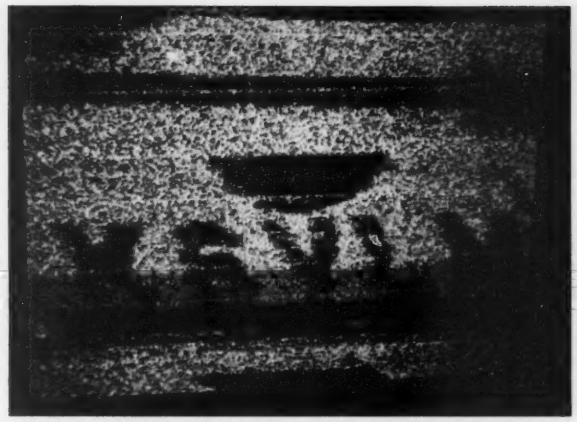


Photo C. Sam K6VLM's 1 watt signal, as seen via the airborne repeater.

DIGI-FIELD
FIELD STRENGTH METER

ANTENNA DEVELOPMENT
COMPARISON PHASE
POLARIZ GROUNDINGS
ADJUSTMENTS PATTERNS
RF LEVEL IN RADIO ENVIRON.
MICROWAVE OVEN LEAKAGE
HELPS DETECT TVI/T-HUNT
SNIFF 60 CYCLE NOISE
DC TO 12 GHz
CALIBRATION CURVE IN dBm
DETECTOR OUTPUT CONCTR.
MODEL "A" NORMAL USE
MODEL "B" ULTRA SENSITIVE
OWN TELESCOPIC ANTENNA
EXTERNAL ANTENNA OPTION
LOW BATTERY INDICATION

$119.95 Plus $6.50 s/h

MasterCard VISA AMERICAN EXPRESS

To order call - (800) FIELD 58 (343-5358)
I.C. Engineering 16350 Ventura Blvd.
Suite 125, Encino, CA 91436 PH.(818)345-1692 • 818-345-0517 Fax

CIRCLE 293 ON READER SERVICE CARD

All Aluminum

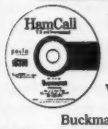
Chassis Kits	Rack Shelves
Cabinet Kits	Rack Equipment Cabinets
Assembled Cabinets	Antenna Grounding Kits
Slope Box Kits	Tower Mounted Box Kits
UHF & VHF Antenna	Dipole Hangers
Power Divider Kits	Other enclosures

Small sheets Aluminum and Brass

Byers Chassis Kits
Charles Byers K3IWK
5120 Harmony Grove Road, Dover, PA 17315
Phone 717-292-4901
Between 6PM and 9:30PM EST. Eves.
"Distributorship Available"

CIRCLE 222 ON READER SERVICE CARD

HamCall CD-ROM
U.S. and International Callsign Lookup
Nearly 1,000,000 Listings
Thousands of Public Domain Programs



Includes Clubs & Military
Still $50, + $5 Shipping & Handling per Order
Works on PC and Mac

Buckmaster's HamCall CD-ROM looks up calls in seconds. U.S. calls can be searched by any element, including name, city, state, etc. A TSR is included to look up callsigns from almost any text application. Prints labels. No hard disk required, everything is on one CD-ROM! New CD-ROM disc every April and October, with updated listings and dozens of new programs!

BUCKMASTER
Publishing
Rt. 4, Box 1630-Mineral, VA 23117
703:894-5777 800:282-5628

VISA

CIRLCLE 56 ON READER SERVICE CARD

Subscribe to *73 Amateur Radio Today* Call . . . **1-800-289-0388**

THE FAMED 2 METER
Also the ultimate for scanners bcb to 1300 MHz.

A. S. A. 9209

+9 db Co-Linear "MultiWave" Base Station Double 5/8 over 1/4 wave delivers up to +9 db gain. All fiberglass & solid aluminum construction. Fits masts up to 1-1/2". 2 Meter Base Station 10' length.

Made in USA **$36.73**
+ $5.00 S&H
(SC RES. 5% SALES TAX)
CHECK IN ADVANCE OR C.O.D.
ALSO AVAILABLE IN 220 & 440

ASA

"Service is the Reason For Our Success"

Model 9209
+9db

Tel: (803)293-7888 P.O. Box 3461
Watts: 1-800-722-2681 Myrtle Beach, SC 29578

CIRCLE 18 ON READER SERVICE CARD

HamCall CDROM
QRZ NEW $24.95
Search calls by name,city,state ect. Plus hundreds of PC compatable programs Radio MODS, TCP/IP,USENET Ham Radio Archives, FCC Rules & Regs. Exam Question Pools + Canadian Calls
$17. CICA WINDOWS SHAREWARE
$17. GIFS GALORE 5000 GIFS!
$17. OS/2 SHAREWARE
$19. GIGA GAMES (NEW CDROM)
$25. INFO-MAC 10,000 MAC FILES
$29. LINUX ON CDROM (UNIX CLONE)
$389. 94 IC MASTER ON CDROM
VISA - MC - 7 DAYS 24 HOURS
RON'S CDROMS (408) 241-7376

CIRCLE 377 ON READER SERVICE CARD

Slow Scan Television
doesn't have to be expensive anymore
Quality Color SSTV
is easy and affordable with Pasokon TV.

Pasokon TV **$229.95**
Send and receive all popular modes.
Hardware interface fits inside computer

New – SSTV Explorer **$94.95**
Small receive-only interface plugs into serial port.

Both require IBM PC/AT or compatible, '286 or better CPU, color VGA display, MS-DOS. Prices include free shipping to U.S.A. Write or call for complete details.

Absolute Value Systems
115 Stedman St. #7
Chelmsford, MA 01824-1823
(508) 256-6907

CIRCLE 351 ON READER SERVICE CARD

Number 21 on your Feedback card

ABOVE & BEYOND

VHF and Above Operation

C. L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119

Microwave Waveguide Construction: Detector Mounts and Transitions

This month I would like to pass on information about constructing microwave waveguide components. I want to cover diode detector transitions and other bits and pieces, in response to several questions. Where can you find these? The answer is they can be found at swap meets and such. If you can't find them, you can construct them at home out of very junky waveguide scrap, with just a little effort. The construction doesn't require close tolerance work; suitable devices can be constructed in any home workshop. The units you construct should have a usable frequency span of an octave or more.

The best waveguide to select for construction is brass because it can be soldered with a heavy soldering iron (300W or so), or even a small torch is OK. Aluminum can be used, despite the fact that it cannot be soldered without special fluxes. This can be done, but I feel that it's not very effective. I don't use the special aluminum soldering fluxes. They are costly, and my experience with them has given poor results. Let's get on with the construction and remove the veil of secrecy from these useful microwave components.

Finding Waveguide

Where do you get material for this construction project? Well, waveguide can be purchased new from suppliers at nearly $4 a foot, but most suppliers have a minimum order value far in excess of what you are probably willing to spend, pretty much removing that source from our list. What I prefer to do to remedy this situation and to keep prices low is to select some scrap sections of used waveguide at swap meets. These can be part of an attenuator or other obscure Old World test or filter section. These waveguide pieces can best be described as a short section of guide with something in the middle of the section that is not desirable and would make good doorstop material. The modification is to cut off the middle section and toss it into the junk box or scrap metal box.

The more obscure the guide section looks, the more inexpensive the part will be. I always try to locate something in the surplus market that was bent into something special, with an appearance more like a pile of worms than waveguide. The reason

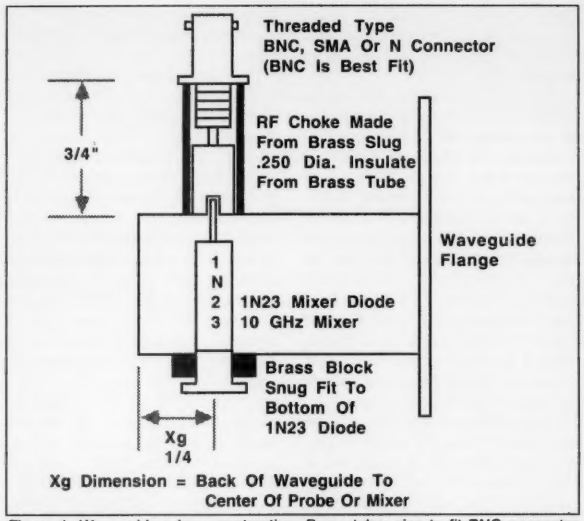
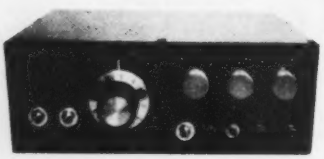


Figure 1. Waveguide mixer construction. Brass tube: size to fit BNC connector. Brass choke: 0.250" long, with hole to fit 1N23 diode, and other end soldered to connector. Insulate from brass tube with Scotch tape. Ground the diode's bottom end in the brass block. The dimension for Xg is 1/4 wavelength, modified by the velocity change in waveguide, or (Xg). The length is 1/4 Xg. For further data, see the BASIC program in the sidebar to compute Xg.

AMATEUR TELEVISION

GET THE ATV BUG



New 10 Watt Transceiver
Only $499

Made in USA
Value + Quality
from over 25years
in ATV...W6ORG

Snow free line of sight DX is 90 miles - assuming 14 dBd antennas at both ends. 10 Watts in this one box may be all you need for local simplex or repeater ATV. Use any home TV camera or camcorder by plugging the composite video and audio into the front phono jacks. Add 70cm antenna, coax, 13.8 Vdc @ 3 Amps, TV set and you're on the air - it's that easy!

TC70-10 has adjustable >10 Watt p.e.p. with one xtal on 439.25, 434.0 or 426.25 MHz & properly matches RF Concepts 4-110 or Mirage D1010N-ATV for 100 Watts. Hot GaAsfet downconverter varicap tunes whole 420-450 MHz band to your TV ch3. 7.5x7.5x2.7" aluminum box.

Transmitters sold only to licensed amateurs, for legal purposes, verified in the latest Callbook or send copy of new license.

Call or write now for our complete ATV catalog including downconverters, transmitters, linear amps, and antennas for the 400, 900 & 1200 MHz bands.

(818) 447-4565 m-f 8am-5:30pm pst. Visa, MC, COD
P.C. ELECTRONICS
2522 Paxson Lane Arcadia CA 91007
Tom (W6ORG)
Maryann (WB6YSS)

QUALITY THAT'S AFFORDABLE

Tri-Ex is pleased to announce the reduction in price on the most popular models of quality Tri-Ex towers for the Amateur radio enthusiast. The overhelming acceptance of the listed models has made it possible for Tri-Ex to pass on substantial savings to our valued customers.

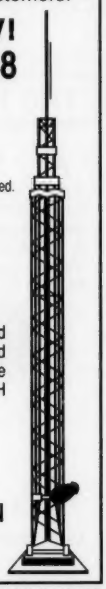
LM-470 WAS $3,945 NOW! $3,658

	Was	Now
WT-51	$1,245	$1,050
LM-354	$1,865	$1,300

The LM-354 is supplied with a hand winch brake system. The LM-470 is motorized.

VISA TO ORDER CALL 800-328-2393 MasterCard
TECH SUPPORT 209-651-7859
FAX 209-651-5157

All towers are complete with rigid concrete base mount and rotator mounting plate. Tri-Ex prints and calculations provided with tower are compliant with 1991 Uniform Building Code (U.B.C.) Engineering designed to 1991 U.B.C. - 70 MPH



Tri-Ex® TOWER CORPORATION
7182 Rasmussen Ave. • Visalia, CA 93291
Unsurpassed Quality since 1954

CIRCLE 22 ON READER SERVICE CARD

for picking up these obscure sections of waveguide is simple: We only want the flange end and about an inch of waveguide behind it for our applications. The rest can be junked. Usually these special bent pieces will yield two flanges and short sections of guide. That's all we need to construct either a detector mount or a transition to coaxial connectors for our use. In these applications we can use SMA, BNC, or even type N coaxial connectors.

Any connector can be used; the important point is where the coaxial connector's pin is located in the waveguide in respect to the shorted rear end of the guide. Basically, the detector mount construction is almost the same as for a transition. The detector mount difference is due to the diode decoupling capacitance. In this way it varies from the transition, which does not require any decoupling. Whichever unit you construct, the design principles are the same.

Let's start with a detector mount construction and its capacitance decoupling. To obtain this output capacitance for the diode detector, a small circular tower (pipe) is built on top of the waveguide to accommodate this capacitor. The capacitor is constructed out of a solid piece of brass round stock that is cut to size, allowing a fit when insulated inside the tower pipe. This makes it an RF short at microwave levels, hence it is an RF choke. Together with the diode mounted in the waveguide, this tower connects with the business end of the diode and connects it to the coaxial connector for easy use. The RFC (brass rod) decouples the RF at microwave frequencies, giving good isolation from the waveguide RF to detector output at low frequency RF, usually 145 MHz. The RFC is not apparent at 145 MHz.

Photo A. Example of a homemade horn constructed from PC board and a transition for 24 GHz. Note the small coax connector center for size comparisions. Photo by WA5VJB.

Well now, how about a little boring math? This is needed to construct these devices for your desired frequency or different waveguide type. This formula is good not only on 10 GHz but also on almost any frequency for which you have a section of waveguide, even 24 GHz. The calculations are needed to determine where to position the diode or coaxial probe. The computer program in the sidebar gives the required spacing needed for proper operation. I have made the pro-

QSO Tutor®
Study Aid for the Amateur Radio Exams

No-Code Tech. Package - $39.95

Mac® IBM®

Now Available, New No-Code Question Pool

- Runs on IBM compatibles or Macintoshes
- Programs are available for Novice, Technician, No-Code Technician, General, Advanced and Extra Amateur class exams as well as Commercial Radiotelephone and Commercial Radar Endorsement. Each program sold separately.
- Work with the entire question pools, or study questions automatically selected by the program from your weakest areas.
- Questions current as of July 1993
- Includes full screen graphics, explanations on appropriate questions and, on the IBM version, a pop-up calculator.
- Logs multiple study sessions and allows resuming at a later time. Returns to review missed questions if desired.
- Creates randomly generated sample tests on-line or printed with graphics on Epson/IBM or Macintosh printers.
- Public Domain Morse code tutor is included on request at no extra charge.

Compare the features - No other theory tutor contains the entire question pool, explanations, graphics, progress analysis and automatic concentrated study where you need it.

"Great Programs - I passed the advanced and extra licenses both in one morning! After 12 years as a general. The sample test portion really got me going! See you in the pileups!" WB8YJF

"As far as I am concerned, there is nothing like the QSO Tutor program. I have tried another and believe me, there is no comparison." KA3ZBE

"The most advanced program I've tried ... Graphics are extraordinary ... This program should be your first consideration." Gordon West - Worldradio

"Do I recommend the QSO Tutor? Heartily, yes! It really motivated me and it's a great way to test my progress. The learning is a natural by-product of the fun I am having." Jim Bail - 73 Magazine Review

Also Available :
QSO Controller®
The ultimate companion for controlling late model Kenwood rigs.
- Full mouse driven graphical user interface.
- Controls all functions of TS-950, 940, 850, 811, 711, 450, 440 and 140.
- Includes integrated logging, custom scanning, extended memories with annotation, real time S & multi-meters on screen, GMT, in/out-of band conditions by license class, and much more.
- Available for Macintoshes and IBM compatible (EGA or VGA only)
- Call or write for details

$99.95

$29.95 per class for Novice thru Extra and Comm. Radar

$39.95 per class for No-Code Tech; (Novice and Tech programs) and Commercial Radiotelephone

PA residents add 6%. Price includes shipping.

QSO Software
208 Partridge Way
Kennett Square, PA 19348
215-347-2109 (Voice or FAX)

QSO Software
Specialist in Software for the Micro by WB3B

CIRCLE 145 ON READER SERVICE CARD

LUKE POWER SUPPLIES

CONTINUOUS DUTY AMPERE RATINGS

SALE - $25 OFF of S40, S55, S65, S35H $50 OFF of S80, S100, S55H
Exp. 12-1-93

S40-40AMP-13.8V	$275
S55-55AMP-13.8V	$310
S65-65AMP-13.8V	$425
S80-80AMP-13.8V	$540
S100-100AMP-13.8V	$585
S35H-35AMP-28V	$445
S55H-55AMP-28V	$540
S25VH-25AMP-50V	per quote
S55VH-55AMP-50V	per quote
OPTIONAL RACK MOUNT	$65
OPTIONAL LCD METER	$75

- Electronic Regulated
- Fold Back Current Limit
- Crowbar Protection
- Over Temp Protection
- Over Temp Indicator
- Input Surge Protection
- Digital LCD Volt/Amp Meter w/display hold (optional)
- Soft start on most models
- Made in U.S.A.
- One Year Warranty
- Rack Mount Option
- Crowbar Indicator
- 120/240v all models
- Ripple Low as 2mv
- Industrial transformer manufactured in U.S.A.

LUKE CO.
7113 North 9 Mile, Lake City, MI 49651
(616) 229-4593

VISA M.C.

CIRCLE 243 ON READER SERVICE CARD

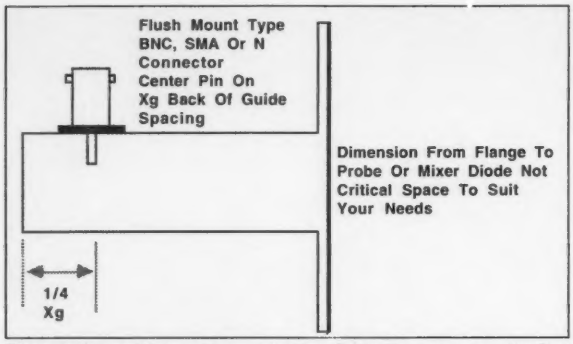


Figure 2. Waveguide transition construction. Solder the coax connector direct through the mounting hole in the top of the waveguide. The pin on the connector should be 0.1" long for 24 GHz and 0.2" long for 10 GHz. SMA center pin diameter is OK for 24 GHz; for 10 GHz the diameter of the pin should be 0.050".

gram short and easy to use—no frills here.

The calculations depend on just what type of waveguide you are using and what frequency you wish to optimize your device for. Table 1 includes some of the more popular waveguide types and lists both their "WR" number and the older equivalent "WG" number. To match waveguide up I have also included the guides' inner and outer dimensions so you can compare the guide you have to the table for identification. Normally, for 10 GHz WG-16 is used, but WG-17 can also be used. As a matter of fact, you can mix sections of both WG-16 and WG-17 without much extra loss; this works reasonably well. Just bolt up as best you can with the smaller waveguide centered about the larger waveguide's opening and drill the larger guide bolt holes to match the smaller bolt pattern. Then connect them up.

I don't mean to say that you can use several conversions between two points, but rather that in a line of, say, WG-16 you can terminate the end in WG-17 with little change in loss compared to a proper termination. We have observed additional losses in the 0.4 dB range for this adapting. Not much of a price to pay for making something usable. See Table 1 for dimensions for your frequency selection. XG is the dimension for a guide wavelength, which is shorter than free-space wavelength.

Computing Guide Wavelengths

The guide wavelength program (see sidebar) in BASIC requires only the broad width of the waveguide and the frequency of operation to compute the guide wavelength. Guide wavelength is different from free-space wavelength and must be accounted for. "X" is calculated for free-space wavelength at sea level and some humidity is entered into the calculation. It uses a fudge factor instead of using the more familiar 300,000 figure. The guide wavelength is then divided by 4 (step 84) and this is the quarter-wavelength dimension needed for the probe or diode placement in your selected waveguide. The probe is centered about this dimension from the rear inside point of the waveguide in both applications.

Now for some practical applications in the real world. If you go and check these calculations out against existing transitions and mixer diode mounts that you might have, I hesitate to tell you, but there will be some glaring errors. Primarily, the errors in sizing will happen because the part being measured was designed for some other frequency that we are not aware of. When we think of material being suitable for 10 GHz, remember that some of the commercial equipment was designed for use at 12 GHz and this could be part of the error observed in the calculations. Any other errors can be attributed to the free service that I offer, and will be taken in the same regard. To place a "forgiveness" factor in any calculations you could make the rear wall a little longer and place a solid metal plug to fit the inner waveguide dimensions. Adjusting this metallic plug will allow any error in assembly to be effectively adjusted out of the unit. It requires more construction but is a fine-tuning method.

Construction Details

Actual constructed mounts are depicted in Figure 1 for the transition and Figure 2 for the waveguide mixer mount. I think it has been shown that being off a few thousands will not have much effect on the quality of your mount. However, when you construct anything with waveguide, having any material like solder inside the guide will have a detrimental effect and will increase the device's loss. These materials include various solders and fluxes, water, any obvious metal particles, or burrs on the edges. The mating flanges can be commer-

VIDEO SYSTEMS

MINI-CAMERA
Size: 1x1x2 in. Weight: 2.5 oz.
Power: 7-14V/80mA. Sens: 2 lux @ f1.8
Lens: 3mm, 4mm. Output: NTSC @ 1V.
The camera has been used in: ATV, Security and Surveillance, R/C airplanes and Robots!
$269 +s/h

TRANSMITTER, 434MHz.
ATVM-70, a 80mW. Mini-size 1x1.3 in., 2.5 oz.
Power: 7-9.6V/80mA.
$129 +s/h

Satisfaction Guaranteed!

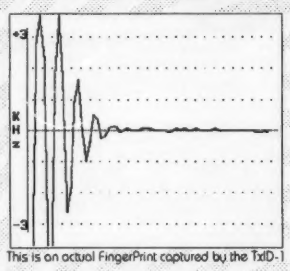
DOWN-CONVERTER
For 434 MHz. Low noise MOSFET front-end for greater sensitivity. Output on TV channels 3-4.
$89 +s/h

Order Now, from stock!
(800) 473-0538
or (714) 957-9268 for technical information.

MICRO VIDEO PRODUCTS
1334 S. Shawnee Drive, Dept H
Santa Ana, CA 92704-2433

CIRCLE 30 ON READER SERVICE CARD

MoTron Electronics
310 Garfield Street Suite 4 Eugene, Oregon 97402



This is an actual FingerPrint captured by the TxID-1

TxID-1
Transmitter FingerPrinting System
Now Shipping!

Radio transmitters have a unique frequency versus time characteristic--even radios of the same make and model. This "FingerPrint" can be captured, stored and analyzed. Our advanced software and the patented technology of the TxID-1 can help you identify the abusers on your repeater!

The MoTron Electronics' TxID-1 includes a sophisticated circuit board that plugs into your IBM/Compatible computer and our exclusive software.

Call or write for a brochure with full details, additional examples, and technical specifications.

TxID-1 with Software $699.00

Shipping/Handling UPS Ground USA: $8.00
Visa/MC and AMEX accepted. COD on cash or Money Order basis only.
Government Purchase Orders accepted.
Orders: (800) 338-9058
Info: (503) 687-2118 Fax: (503) 687-2492

CIRCLE 248 ON READER SERVICE CARD

cial or homemade, and should be flat to mate well with each other.

The only trick with old flanges or home-brew flanges is to make sure that the surfaces are flat. To be sure, lightly file any rough edges to approximately flat. Then place a sheet of light grade emery or sandpaper on a small section of junk glass. Sand the flange and waveguide with the flange face-down on top of the glass plate. Sand flat on the sandpaper/glass, moving with a circular motion. In this way you will guarantee that the flatness of the glass sanding table will be transferred to the waveguide flange. After a few passes on this sanding table it will be obvious how well this method works. The high and low spots are very evident on the sanding just completed. When the flange is uniform in appearance, it is flat.

Well, that's it for transitions. The main point is: Don't let junky-looking waveguide remain in the scrap heap. Even the most wormy-looking section can be put to use if it has a one- or two-inch straight section. The coaxial part of the probe should enter the waveguide about half of the waveguide's small dimension for good coupling. SMA connectors have quite small probes. In this case, build it out with a small brass tube about 1/16 inch in diameter to make the probe wider. Remember, dimensions can be very forgiving. High accuracy is not required in construction. A milling machine is not required.

Mailbox

Raymond Clancy of Westminster, California, writes, "Where can I locate surplus LNAs to convert, as per your May '93 column?"

Well, Raymond, that's the paradoxical question, as they are where you find them. I have responded to several newspaper advertisements for satellite service and have had lots of rejections, but one strike. I believe this method could be tried in almost any city to attempt to locate some used LNAs. These are not much use to commercial dealers; these dealers should be your best bet. Some dealers don't want to talk about used units, they'd rather do a sales pitch on new systems. I guess some business owners don't want to redistribute used material, perhaps because they fear competition for new sales. In this case stress that the units will be torn apart and that they are not going back into satellite service, but into amateur radio service instead.

Some shops will hustle you for a high price, without knowing the LNA's condition, presumably because they are still trying to sell you a new unit. You just have to get by that barrier. For the time being, since you are located in the Los Angeles area, I would suggest you go to the swap meets, particularly at TRW, which is in the Los Angeles area. Cost for most units as is should be no more than $5. That's the typical price I have found for swap meet units. And don't overlook the local non-ham swap meets—there are a lot of people getting rid of their satellite systems. The bottom line is that if the asking price for an old 80-to-100-degree LNA is over $5, they're asking too much. That is, unless the unit is new, from stock, and never used. I paid $25 for my first LNA and $35 for the first 12 GHz LNB. What a price to pay for education.

Mark WØPMX wants information on the Mitsubishi M57716. I looked at my reference material and could not come up with the data. RF Parts Co., a *73* advertiser, lists many of the modules for sale, but not the M57716. What Mark needs is the pinout information and spec sheet for the device. Does anyone out there have the information for him? He is at 4810 Indiana St., Golden CO 80403. I am sending off to Mitsubishi for data on their modules, and I hope to get back to you soon with data.

Well, as I write this column I am getting ready for the last weekend of the ARRL 10 GHz contest. The plan this month is to operate near our local area and get as much activity up and running as possible. I will be operating SSB with 10 watts power output to a 30-inch dish. I plan to bring my older system, a wideband FM unit, to be able to work those stations using wideband. This year N6IZW and I plan to test a video system with our narrowband rigs on 10 GHz. W6VLF and N6OYJ plan to do similar work at the other end of the test link. The test will be to attempt a two-way contact on 10 GHz video. It's just a preliminary test and I'll fill you in on the results next month.

Don't let video operation or SSB operation displace wideband FM operation. All modes have their place, and I have had lots of fun with wideband FM just experimenting and trying different modes of operation.

Well, that's it for this month. As always, I will be glad to answer questions concerning this and other related subjects. Please send an SASE for a prompt reply. Best, 73 Chuck WB6IGP. 73

TABLE 1.

WR #	WG #	OD-inch	ID-inch	Freq. GHz
WR-90	16	1.0 X .5	.9 X .4	8 - 12.4
WR-75	17		.75 X .375	10 - 15
WR-42	20	.5 X .250	.420 X .170	18 - 26
WR-34	21	.420 X .250	.340 X .170	22 - 33

Figures for WG-16 (8 TO 12.4 GHz):

Frequency	10000	10050	10368	10500	MHz
XG=	29.978	29.828	28.914	28.550	MM
XG=	39.703	39.359	37.320	36.553	MM

Figures for WR-42 (18 TO 26 GHz):

Frequency	24000	24193	24240	MHz
XG=	12.491	12.391	12.362	MM
XG=	15.407	15.221	15.167	MM

Formula to figure your own:
Xg = Guide Wavelength
$Xg = X / \sqrt{(X/2a)^2}$ where X = wavelength in MM and
a = Guide ID width (WG-16 = .9 inch)

COMPUTER PROGRAM IN BASIC FOR COMPUTING XG

Example of sample calculation:
Wavelength in MM = 299780 / freq. in MHz
Example: 28.9139 MM = 299780 / 10368 MHz)

Guide Wavelength Program

```
 1 REM PROGRAM COMPUTES THE GUIDE WAVELENGTH "Xg"
 2.REM OF SPECIFIED WAVEGUIDE SUCH AS WG-20 OR 16
 3 REM FORMULA USE Xg=WAVELENGTH/SQR
   (1- WAVELENGTH/2*a)^2
 4 REM FOR WAVEGUIDE 16 OD= 1 INCH BY .5 INCHES  A=.9 INCHES
 5 REM FOR WAVEGUIDE 20 OD= .5 INCH BY .250 INCH A=.170
 6 REM PROGRAM FORMULA COMPUTES IN MILLIMETERS
 8 INPUT "DIMENSION 'A'OF YOUR WAVEGUIDE IN INCHES",A
10 INPUT "FREQUENCY IN MHZ     ",F
22 X=299780!/F
23 PRINT "WAVELENGTH FOR FREQ SELECTED ",X," MM"
24 B=2 *(25.4*A)
65 G=X/(SQR (1-(X/B)^2))
80 PRINT "Xg GUIDE WAVELENGTH IN MM    ",G," MM"
84 H=(G/4)/(25.4)
90 PRINT "1/4 guide wavelength in inches is ",H,"inches"
94 PRINT
96 GOTO 10
```


KENWOOD

HOT HOLIDAY SPECIALS

TS-950SDX

$3699

TS-850SAT

$1659

orders & price quotes

1•800•433•3203

Hardin Electronics

Proudly serving the Amateur Community for over 25 years.

5635 E. Rosedale St. Fort Worth, Texas 76112

FAX(817)457-2429 Questions (817)429-9761

VISA•MASTERCARD•DISCOVER•AMERICAN EXPRESS

Prices and availability are subject to change without notice.

CIRCLE 331 ON READER SERVICE CARD

Number 22 on your Feedback card

ASK KABOOM

Your Tech Answer Man

Michael J. Geier
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

The Case of the Mystery Rig

I'm going to assume that, because you read this column, you're at least somewhat technically inclined. So, I can also assume that you have been to hamfests and have occasionally picked up a "mutt" of some kind, mostly because it was cheap and it looked like a challenge. I know I've bought things I couldn't possibly use, just for the puzzle they presented, or because I rationalized I could sell them after I fixed them. (That almost always turned out to be a bad idea which resulted in my working for about $4 an hour.) Nonetheless, I've enjoyed owning some of the "mystery rigs" that have followed me home now and then, and some of them are still in active use in my station.

What First?

OK, you bought a radio or some other electronic marvel for next to nothing. You know it doesn't work. Where to start? Well, before you plug it in or insert batteries, consider taking a look inside. You might be surprised at what *isn't* in there! Recently, I picked up a Uniden 10 meter rig for a ridiculously low $10. The seller didn't hide the fact that it didn't work, but I sure was surprised to find that the microprocessor had been removed. Ouch.

If the radio looks complete, go ahead and apply power. One exception would be in the case of antique-vintage gear whose electrolytic capacitors might not have seen voltage in many years. By simply turning such things on, you might literally blow those caps to smithereens! A Variac is very helpful with that kind of equipment. Another exception would be if you see any signs of a short: burned parts or a charred PC board. There's no sense in repeating a disaster.

With modern, solid-state gear, a Variac is a bad idea. First of all, modern electrolytics don't blow up (well, not very often, anyway), and second, many devices employ switching power supplies or regulators, and they don't like the gradual power approach one bit. Most just won't work at all below a certain voltage, but will suddenly spring into action above their thresholds, thus defeating the purpose of gradually raising the power. And some will actually malfunction on low voltage in such a way that you think something's broken when it isn't. So, go for the gusto and give it the juice. Just remember, where there's smoke there's fire, and you sure don't want one on your workbench; if you see any smoke, turn the thing off quickly.

Zip

Most likely, though, what you'll see is nothing at all. Or, perhaps, the pilot lights or display will come on but nothing else will happen. Can you fix such a beast?

Sure, why not? Naturally, the best thing you can do is get the schematic. For a currently available or recent-vintage rig, that should be no problem. Unfortunately, many hamfest treasures are older or of oddball origin, and you may have trouble getting the data. If you have packet radio capability, I strongly suggest you put up a notice looking for help. I recently did that after I brought home a Santec HT-1200 2 meter walkie. This older radio falls into the worst of both categories: It's old *and* it's relatively obscure. Yet, within a week I had the diagram and owner's manual in my hand, thanks to a caring ham who also had a broken '1200.

If you've got the diagram, you should be looking at a fairly straightforward repair job. That is, if the previous owner hasn't already botched the rig's insides. Unless the price is *really* low (as it was on the '1200), I avoid any gear which has had obvious tampering. There's an old saying about driving a car: Always drive as if everyone else is crazy except you. I feel the same way about technical work: Everybody else is incompetent. Obviously, that isn't really true, but enough people are that trusting another's work is asking for big trouble.

Which Came First . . .

When exploring a broken rig with a muddy history, it can be hard to tell which problems were original and which were the result of incompetent repair attempts. Let's examine the case of that Santec walkie; it's a great example of what you can run into. When I got it, it had an obviously destroyed tantalum capacitor. The seller pointed to it and told me that "that resistor is blown. That's all that's wrong." The component misidentification and the lack of the radio's back cover told me I was in for some real detective work.

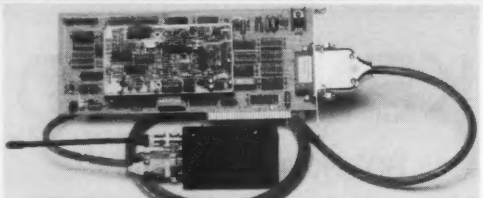
I hadn't yet gotten the schematic but, luckily, there was enough left of the capacitor that I could read its value. The part was charred and the top of it was completely missing. From experience, I knew that the most likely cause of that kind of catastrophic failure in a tantalum is reversed polarity. That's about the worst thing you can do to a radio. Uh oh, could someone really have made that mistake?

It didn't seem likely. The battery pack obviously had been replaced, because its wires had been spliced onto the old connector. But, the positive terminal was connected to the red wire, and the negative to the black, so that seemed normal. Plus, the external power jack had a series protection diode, so reversed polarity there wouldn't make it to the inside. Hmmm, I guess that cap must have blown for some other reason.

More Clues

After replacing the cap, I applied power to the rig through the external power jack. Naturally, the thing didn't

Fast Packet Ticket!



The PackeTwin™ Wireless Communications System

Thinking about the move to packet radio? Or have you already tried 1200 baud packet only to become quickly discouraged?

At Gracilis, we've got the ticket to the kind of speed you're looking for.

Using our PackeTwin system with your existing IBM®-PC or compatible, you'll easily be able to communicate with other packet radio stations at rates of 9600 or 19,200 baud. If higher speeds are desired, the popular WA4DSY modem can be constructed and added to provide operation at 56,000bps.

When you order our PackeTwin Wireless Communications System, you'll get a plug-'n'-play 9600/19,200 baud system, complete with modem and palm-size two watt UHF transceiver. You supply the PC and antenna—*We supply the rest!*

Consider these important features...

- **Exclusive use of the PC's DMA channels provides an upgrade path to 1Mbps**
- **A second channel is included that can be used to provide a separate RS-232 or RS-422 interface**
- **Free software provides access to AX.25 and TCP/IP networks**
- **Free firmware provides updates**

For information contact your distributor, or...

VISA MasterCard

Gracilis *The new name in Packet Radio*

623 Palace Street, Aurora, IL 60506 Ph:(708) 801-8800/FAX:(708) 844-0183
Email: info@gracilis.com

IBM is a registered trademark of International Business Machines Inc.; PackeTwin is a trademark of Gracilis, Inc.

CIRCLE 291 ON READER SERVICE CARD

Computer Controlled Ham Shack for personal or club station

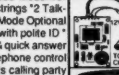
Ultra Comshack 64 Duplex/Simplex Controller

HF & VHF Remote Base & Repeater *Autopatch *Rotor Control *Voice Meters*Paging*Logging*Polite ID's*Voice Packet B.B.S.

Model CS64S
REV 8....$379.95
Includes: C64 Interface, disk, cables, Manual
Add $5.00 S/H U.S.A.
CA. address add 7.75%
Ask for free catalog!

Here are just a few of the Ultra's advanced Features:
Load, save, change all from T.tones, Packet, or modem **Unlimited voice vocabulary** *Voice clock executes events Daily & Weekly **Super Macros** user programming language! ***300-4 digit user access codes** ***Disk & Printer logging of telephone numbers dialed, usage time, functions** ***18 Rotating Polite ID's*** 16 External relay controls *CTCSS Tone Paging* ***CW Practice*** with voice *Security mode, T.tone mute* Voice announced user call sign when logging on *Voltage proportional courtesy beep indicates signal strength* ***18 rotating Polite ID tails*** Safety timers & overrides **"Ultra Link" provides T. tone control from remote audio monitored *User programmed multi-tone courtesy beeps each mode *Modem or Packet control* 9 T.Tone Macros store 28 digit command strings *2 Talking Meter inputs * Packet+ Modem input* Simplex Repeater Mode Optional with DVR * **WX1 & PK8** speaks temperature and humidity with polite ID * **Autopatch & Rev.** *Store 1000 (18 digit) tel. #'s *Quick dial & quick answer * Directed & general page *50 tel #'s restricted patch *Telephone control input* Regenerated touchtones *Autopatch auto off, detects calling party hangup*Pulse or touchtone dial *Call waiting & last number redial* **H.F.+VHF Remotes** H.F. & VHF SQ. det *Scan up/down;100Hz step + variable scan rate *Monitor mode defeats PTT*Lock mode allows T. tones to TX through *Tune mode & split select *9 Scan memories store Mode, splits, VFO A & B *Talking Meters; Voltmeter * Voice & CW Beacon *Voice Rotor control **Ultra Comshack 64 Model CS64S... $379.95**

Video Multi-Page letter & graphics Gen.
*A1V, Slow Scan; HI Res * Autoboot C64 EPROM CART *Used by 100's of CATV sys for Local channel insertion *Time / date macros send touchtones, vary seq. & load *Multi-page Modem transfer* Video/Audio *240 letter crawls, flash lines* modem *Special effects, 16 colors* disk *NTSC output & color bars* Model "VIDG" $189.95 inc. disk+ out cable *PK8 & WX1 adds relay control & Temp. & Humidity



AUDIO BLASTER™ Works inside all H.T.'s!
AB1S <--Miniature Audio Amp/ Used by police Module installs inside all H.T's; 1 watt audio amp ! When it needs to be loud! Universal installation diagrams AB1S.... $ 24.95

TSDQ QUAD TSDQ 4 DIGIT Touchtone Decoder QUAD Relay Expansion plug-in option
TSDQ use as Repeater On/Off, C64 reset, 8/20 VDC , audio in; Field Program 50,000 Codes; Mom. & Latching; Inc. DPDT Relay; LED digit valid & latch; 24 Pin connector. **QUAD option** adds: four 2 Amp. relays + 5 digit on & off code for each relay. 2"X3"
4 Digit Decoder "TSDQ",$ 89.95; Expand "QUAD"$ 99.95

Touchtone to RS232 300 Baud Interface "Decode-A-Pad" Touchtone audio Input +12V DECODE A PAD 300 BAUD IBM Mac C64
Decodes all 16 touchtones. Works with terminal modem programs.
"DAP" works with all computers inc. 9 pin I/O connector, TTL or RS232 buffered ouputs DAP $99.95

Ultra Com Shack 64 Options
Mount All modules including C64,
Predrilled & painted incl. mounts & cable clamps
ALBX.....$ 159.95

Digital Voice Recorder 32 or 64 sec.
voice Mailbox & ID tail, inc. 1 Meg Ram, control with CS8 or PK8, Incl. cable for REV8 Ultra board, 5 or 12VDC DVM.....$ 179.95

12V Power for C64 & 1541
with this crystal controlled Switching supply, runs cool & efficient draws <1 amp, Plugs into C64, fused, protected, heavy duty
Model DCPS.....$ 129.95

Add Duplex Control of Remotes with Telephone amplified hybrid, null & gain pots, & audio preamps Plugs into CS64S board, TLCN....$ 159.95

Autoboot EPROM cart plugs into C64 or PK8, disk or System version CART...$ 109.95

8 On/Off relays Inc. 3 DPDT 2 A. relays +5 SW. outputs, Use with HM1 to rotate beam.....CS8.....$ 99.95

Add 2 Voice Meters + 2 Alarm Inputs + 8 Relay On/Off Switches PK8 $159.95

PK1 adds Control of Ultra via Packet or Tel. modem and provides a Packet to Voice BBS, Req. 2nd C64 & PK8, Inc. 4 ft data cable to PK8. PK1 $99.95

Speak Temperature & Humidity (Req. PK8) inc. 25 ft. remote cable, or WX1 plugs into PK8. WX1.....$189.95

Rotor control Analog to digital converter; use with CS8; voice bearing +/- 5 deg. for all rotors HM1..$ 69.95

Ultra Com Shack 64 Manual
All schematics, diagrams and how to operate & set up remote base. Refund with purchase of CS64S.MN.$25.00

*Mastercard*Visa*Amex*Disc
ENGINEERING CONSULTING
583 CANDLEWOOD ST.
BREA, CA. 92621
Tel: 714-671-2009 Fax: 714-255-9984

work. Wait a minute, the display came up for a second or two and then quit. A quick check revealed that the blown cap was part of a regulator circuit consisting of a transistor and a zener diode; the zener symbol marked on the PC board was the tip-off that it was a regulator. Both components were blown. Too much voltage? I still couldn't be sure. I replaced them and tried again. This time, the display came on and stayed on, and the keypad even worked (!), but there still was no audio and no transmit. Apparently, nothing but the micro was getting power. Scoping all the pins on the audio power amp chip showed that none had any voltage. I assumed that no power was getting to most of the rig (I was wrong, as you shall see). At this point, the hunt became fruitless because, without the diagram, it just wasn't possible to follow the maze of wires to find out where the power was disappearing. I put the rig away and nearly forgot about it.

A Map

When the schematic arrived, the chase was back on. The first thing I discovered was that the seemingly impenetrable forest of wires and transistors was actually a fairly simple electronic TX/RX switching circuit. But, the Q numbers in the diagram didn't match the ones on the board! Which transistor was which? Wait a minute, there's *another* schematic in here, and it has the right numbers. They must have had more than one version of the board.

Now that I had the correct schematic, I quickly found that the transmit switch transistor was blown. I popped in another one, and the TX LED now worked when I pressed the PTT. I hooked the rig to my dummy load/wattmeter and keyed up. Nothing; the transmitter wasn't working. But I figured that, if I could get the receiver to go, the rest would fall into place. So, I ignored the transmitter and focused on why I had no audio. Why wasn't that chip getting power?

It Ain't Supposed To

Following what appeared to be the DC line of the audio amp chip (the big electrolytic to ground gave it away), I came to . . . a transistor. I should have known: The amp chip wasn't getting power because the squelch circuit was keeping it turned off. Sure enough, the other side of that transistor had full voltage. And, the transistor was good. So, there was something wrong with the squelch circuit. I followed the line back through a couple of transistors to the squelch output of the detector chip and scoped it while I turned the squelch control back and forth. Sure enough, it jumped up and down just fine. That meant that the detector chip was getting power and was, in fact, working. Next, I checked each of the three transistors between it and the squelch transistor. They were good. So were the two diodes. So why the heck wasn't this thing working?

Arrrgggh

I must have spent over an hour going around in circles with this thing. Then I saw it. The wire going to "point B," which was one end of a small coil connected to one of those squelch transistors, was supposed to be for an optional tone decoder, which this radio did not have. That wire shouldn't have been there, yet there it was, going to the microprocessor board. And wait a minute, there was supposed to be a wire sending an "unmute" signal from the micro connected to another point only about a quarter of an inch away. And it wasn't there! You guessed it: Somebody had broken the wire and resoldered it in the wrong place. I moved it back and, wow, the receiver came to life! Now I was getting somewhere.

Can You Hear Me?

A quick check on the wattmeter showed that the transmitter still wasn't working. The diagram showed that the unmute signal enabled the transmitter as well as the receiver, so I had hoped that everything would be fixed. Obviously, the transmitter still wasn't getting power. Or was it? I had never actually listened for it; perhaps it was worth a try.

I set the frequency to 0.52 and keyed it up into the dummy load while listening on my other rig. Son of a gun, there it was, dead on frequency and with good audio! My victory thrill turned to sudden defeat when I realized what that meant: a dead final. Yuck. Sure enough, the final was connected right across the incoming DC line, before the regulator. Nothing there to protect it, and, if the polarity had in fact been reversed, that final would have been a forward-biased diode directly to ground; pretty much a dead short. But then I noticed that there was a 1 ohm resistor between the transistor and the DC line. An ohmmeter check showed it to be 2.6k ohms! I popped in a new resistor and, wham!, 4 watts out, just like it was supposed to be. The resistor had blown, protecting the transistor.

So, the radio was fixed. Well, almost. I was about to consider it finished when I took another look at the battery pack. Yup, the positive goes to the red wire, which goes to . . . I looked at the PC board and saw that positive was going to *ground*. Backward. That connector must not have been the original one, and the previous owner had just assumed the wire coding would be the same. So that was it: The radio had been connected backwards after all. Case solved.

A Thought

Many people assume that a reversed-polarity rig will be completely destroyed. Certainly, reversing the polarity is pretty destructive. Often, however, the regulators and semiconductor switches which are directly connected to the DC line will blow, protecting the rest of the circuitry. Sometimes, as in this case, most of the radio will be fine and well worth fixing.

The End

I hope this little excursion has helped you see what you can be up against when you don't know who else has been inside your new find. Never assume anything, and happy hunting! Until next time, 73 de KB1UM. Hey, anybody happen to have the back for a Santec HT-1200? I have one in good working order that could use it. 73

LOOK WHAT'S NEW FROM DAIWA

.....Have You Seen These Great NEW Products From Daiwa?.....

DAIWA

Antenna Tuners

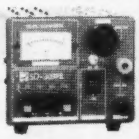
CNW-420 - World famous Daiwa cross needle antenna tuner better than ever! Switchable average or PEP reading, backlit cross needle movement. 20 and 200 watt scales. Built-in 2-position antenna switch. Covers 1.8-30MHz in 11 bands.

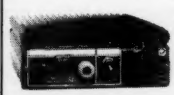
CNW-727 - Daiwa's unique high quality VHF and UHF antenna tuner! Separate tuner sections for popular 2 meter & UHF bands. Handles 200 watts. Tune your 2m and UHF antenna systems for maximum efficiency, low loss!

For Your Boat, Plane..High Quality 24VDC - 13.8VDC DC To DC Converters

NEW

SD-303FII - Attractive desktop DC-DC converter: full front panel switchable voltage & current metering, convenient lighter socket, heavy-duty binding posts and 2 sets of spring-clip DC outputs! A hefty 30 amps putput at 13.8VDC with 20-28VDC input - enough for most any high power application!





SD-412II - Compact, easy mount 12amp output mobile with the size and look of a 30 watt 2m amplifier. Heavy-duty binding posts, lighter socket outputs, large heat sink and more!

SD-416II - Larger 16 amp output model with heavy-duty wrap around heat sink. Front panel binding posts and lighter socket outputs. 20-28VDC input, plus many more features!

EDCO Electronic Distributors Co. • 325 Mill St. • Vienna VA 22180
•Ph.703-938-8105 •FAX 703-938-6911
Available at your favorite Dealer Today!
EDCO

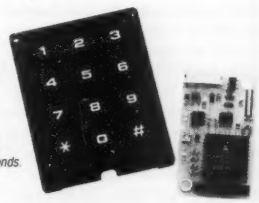
ID-8 Automatic Morse Station Identifier

Compatible with Commercial, Public Safety, and Amateur Radio applications. Uses include Repeater Identifiers, Base Station Identifiers, Beacons, CW Memory Keyers, etc. Great for F.C.C. ID Compliance.

- Miniature in size, 1.85"x 1.12"x 0.35".
- Totally RF immune.
- All connections made with microminiature plug and socket with color coded wires attached.
- CMOS microprocessor for low voltage, low current operation: 6 to 20 VDC unregulated at 6ma.
- Low distortion, low impedance, adjustable sinewave output: 0 to 4 volts peak to peak.
- Crystal controlled for high accuracy.
- Transmitter PTT output (to key transmitter while ID is being sent), is an open collector transistor that will handle 80 VDC at 300ma.
- Field programmable with SUPPLIED keyboard.
- Confirmation tone to indicate accepted parameter, plus tones to indicate programming error.
- All programming is stored in a non-volatile EEPROM which may be altered at any time.
- Message length over 200 characters long.
- Trigger ID with active high or low.
- Inhibit ID with active high or low. Will hold off ID until channel is clear of traffic.
- Generates repeater courtesy tone at end of user transmission if enabled.
- Double sided tape and mounting hardware supplied for quick mounting.
- Operating temperature range, −30 degrees C to +65 degrees C.
- Full one year warranty when returned to the factory for repair.
- Immediate one day delivery.

Programmable Features

- *Eight programmable, selectable, messages.*
- *CW speed from 1 to 99 WPM.*
- *ID interval timer from 1-99 minutes.*
- *ID hold off timer from 0-99 seconds.*
- *CW tone frequency from 100 hz to 3000 hz.*
- *Front porch delay interval from 0 to 9.9 seconds.*
- *CW or MCW operation.*



$89.95 each
programming keyboard included

COMMUNICATIONS SPECIALISTS, INC.
426 WEST TAFT AVENUE • ORANGE, CA 92665-4296
(714) 998-3021 • FAX (714) 974-3420
Entire U.S.A. (800) 854-0547 • FAX (800) 424-3420

CIRCLE 10 ON READER SERVICE CARD

Arnie Johnson N1BAC
43 Old Homestead Hwy.
N. Swanzey NH 03431

Notes from FN42

I received a phone call from Dave Benedict W8REN of Troy, Michigan, one evening. I guess that isn't too spectacular, but he had always wanted to know what the "Notes from FN42" meant. Well, for those of you who are involved in VHF/UHF contesting it might not be too good a question, but for the rest of you it might make you wonder.

Somewhere in the "dungeon" I have a booklet from the ARRL explaining the grid system of the earth, but it seem to be hiding, so here comes my simple (hopefully) explanation.

The earth is divided up into grid squares, each measuring 10 degrees of latitude (600 nautical miles) and 20 degrees of longitude (0 nautical miles at the poles and 1,200 nautical miles at the equator). Each square is given a two-letter designation. Each of those squares is further divided into 100 squares, each one degree of latitude and two degrees of longitude with 00 in the southwest corner and 99 in the northeast corner. The coordinates of Peterborough, New Hampshire, are approximately 42° 52.5'N and 71° 57'W. Those coordinates fall into the FN primary square and 42 secondary square bounded by 42° to 43° latitude and 70° to 72° longitude, thus FN42. Hopefully this explanation has not confused anyone.

Regular readers of this column know I'm always trying to get others involved in this wonderful hobby of ours. I try to keep my eye out for examples of people getting involved and report them in this column.

One of those examples is Chris Edscorn NØCUH. Chris works at the Crotched Mountain Rehabilitation Center in Greenfield, New Hampshire. I remember talking to him on one of the local repeaters when he moved into the area. He was looking for some hams in the local area to help him start a ham club at the center. I am happy to report that he found some help and is very busy developing a ham club and teaching those with disabilities the joy of ham radio.

I attended the open house at their new ham shack. One room in the basement of a building has been turned into operating positions and meeting space. Operating the day of my visit were a 2 meter FM transceiver, a 2 meter packet station, an HF station, and a computer used to learn Morse code. There are approximately six operating positions with coax hookups and both AC and DC power available.

The room was very busy that day and very crowded with young people in wheelchairs and on crutches, some helping with the operation of the equipment and others providing information to new young people who came to find out what was happening. Several of the older ham volunteers were there. They had traveled over two hours to get there, and they had done it many times before to help install the antennas and ready the shack. That's dedication, folks, and getting involved!

I was very heartened to see one young lady in a wheelchair spell her name in Morse code on a practice oscillator and to observe the joy in her eyes when she realized what she had done. WOW! What an experience!

Do you want that same kind of joy? It doesn't have to come from working with disabled young people like Chris does. It can come from helping with classes or testing sessions, or helping with public service during emergencies or worthwhile public events. Foster the use of ham radio on the air. Be positive in your attitude toward amateur radio. Don't be part of a problem, be part of the solution.

Finally, December is a holy month for many of our world's religions. I wish all of you the joy, peace, and prosperity that you deserve. May our world's troubles be solved and peace to all mankind endure.

Happy Holidays! 73, Arnie N1BAC.

Roundup

Mellish Reef *Letter from Murray D. Adams, WA4DAN:* Mellish Reef is located at coordinates 17° 24' S, 155° 51' E. Herald's Beacon Inlet is the only part of the reef that remains above sea level at high tide—it is not much more than a sandbar. It's been over 4-1/2 years since the last Mellish DXpedition, but in January 1989 a group reported that the islet was approximately 150' wide by 800' long.

Since the last operation, a couple of major storms have passed through that area; hopefully things have not changed drastically during this interval. The islet is basically pear-shaped. The intent of our operation is to set up two separate, completely self-contained sites as far apart physically as possible to try to reduce adjacent station intermod. One site will be at the north end and the other site will be at the south end.

One site will contain three HF stations while the other site will have two HF plus one 6 meter station. They will strive to listen as much as possible in the U.S. General class bands.

All DXpeditions have certain logistical difficulties to overcome. Mellish Reef is no exception. Heat (there's absolutely no shade) is a concern, along with the effects of salt spray on the equipment and antennas. Fitful rest on this type of DXpedition is a rarity. For some insight on this, read the fascinating account of the AHIA/Howland Island DXpedition earlier this year.

The Mellish Reef team has spent the last six months planning and working on the logistics for this DXpedition. We all look forward to contacting you from the reef.

The callsign for the operation is VK9MM. The operators are: VK4CCR, VK2BEX, V73C, K5VT, VK2BJL, P29DX, WA4DAN, and G3WGV.

We plan to operate CW, SSB, and RTTY.

Power will be supplied by one 4 KVA and two 3.5 KVA generators. 850 liters of fuel will be transported, and in addition, 80 liters of oil.

Equipment has been donated by Dick Smith Electronics, Coman Antenna Co. Australia, Emtronics Australia, GAP Antenna Products, Cushcraft Corp., Heil Sound, Dunestar Systems, and Oklahoma Communication Center.

On arrival, the team hopes to quickly get a couple of the stations operational using one yagi and one vertical while the rest of the team is ferrying gear to the two sites and assembling antennas, tents, etc.

The QSL manager will be Bill Horner VK4CRR, 26 Iron Street, Gyumpie QLD 4570, Australia. Please include SASE/SAE + $1/IRCs. Any donations will be gratefully received and used to offset the high cost of the DXpedition. QSLing will commence by December 1, 1993.

Many thanks to all of the major DX foundations, many national regional and local DX clubs, and literally hundreds of individual DXers whose support has made this DXpedition possible. Our primary objective is to work as many stations as possible and to give as many who need it a new country.

[As most of you DXers realize, the Mellish Reef DXpedition completed its operation several months ago. This report did not arrive at 73 in time for advance notice. I hope to receive an update from WA4DAN in the future.—Arnie]

USA/Mt. Athos *Letter from Walery Sawka KB2FIV:* I was more than happy to see Father Apollo's SV2ASP statement printed in *73* magazine. Let me explain.

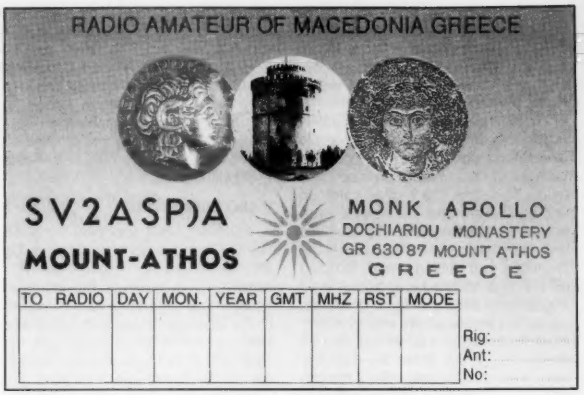


Photo A. The beautiful QSL of Monk Apollo SV2ASP.

About eight years ago, I visited Mt. Athos for the first time. I fell in love with the beauty, people, and spiritual values of the place. It is still a very unique place on our planet. I have been traveling there every year since, not as a tourist, but as someone who shares. I work with them, pray with them, and share their humble life.

I am also a ham and faithful reader of *73* magazine. Through a short note, I learned about the existence of Father Apollo. After a strenuous walk through rough mountains, we met in the magnificent Byzantine Monastery of Dochiariou. He proudly displayed his 2 meter rig. It was an old Kenwood and some wire dipoles. He loved them and was talking about it with gleaming eyes. He had problems, not only with the Administration of Mount Athos to get an operating permit, but with the power supply as well. The monastery operates the electric generator only during the day for using power tools. The rigid monastery schedule doesn't leave much time for hamming. The donated old Japanese generator is not only noisy but produces 117 volts instead of the European 220 volts.

Father Apollo is working hard, long days and prays long nights. He is friendly, gentle, and always smiling. Two years ago disaster struck—a canister of cooking gas exploded! Father Apollo survived with bad burns of the face and was almost blinded! His being able to see is one of the miracles of the Holy Mountain. And then, last year, there was the unpleasant experience with unauthorized transmission of DJ6SI. With my knowledge of Mt. Athos and all the documentation given to me, I don't have even the slightest doubt that it was illegal. How can the ARRL pass such easy judgment?

Father Apollo's problem might happen to us, too—we can become the victims of unauthorized transmissions, tampering with packets, etc. In my opinion, Father Apollo has become the victim, and I hope his faith in decency and people won't be disturbed again. I am including his famous QSL card so

GIVE YOUR
HR-2510 HR-2600
the same features as the
"BIG RIGS"
CHIPSWITCH
4773 Sonoma Hwy. Suite 132
Santa Rosa, CA 95409-4269
Write or call (707) 539-0512 for FREE Information

CIRCLE 265 ON READER SERVICE CARD

CB-TO-10 METERS
We specialize in CB radio modification plans and hardware. Frequency and FM conversion kits, repair books, plans, high-performance accessories. Thousands of satisfied customers since 1976! Catalog $2.
CBC INTERNATIONAL
LOU FRANKLIN/K6NH - Owner
P.O. BOX 31500X, PHOENIX, AZ 85046

Subscribe to
73 Amateur Radio Today
Call 800-289-0388

SURVEILLANCE
& COUNTERSURVEILLANCE Electronic Devices
Bugging/Phone Tapping Detectors • Phone Scramblers
Voice Changers • Telephone Recording Systems
Caller IDs • Vehicle Tracking • Transmitter Kits • AND MORE!
NEW! Covert Video Surveillance Cameras and Accessories
EDE
FOR CATALOG SEND $5.00 TO...
PO Box 337, Buffalo, New York 14226 (716) 691-3476

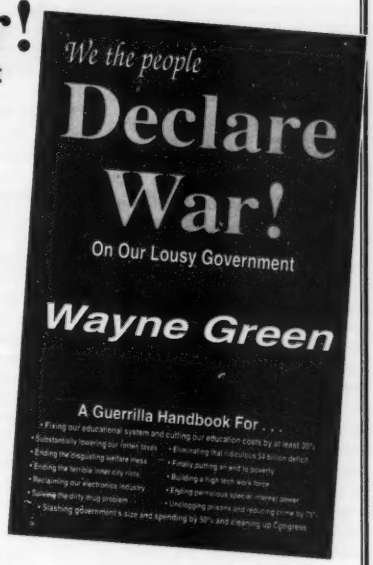
Wayne is mad as hell ...
...and he doesn't want *you* to take it anymore!

Declare War!
On Our Lousy Government

Fed up with the mess in Washington?
The mess in your state capital?
Poverty, crime, our failing schools?
Wayne Green has solutions.
Clever solutions.

Wayne Green's unique reasoning is intriguing — even delightful. Whether you are horrified by his proposals or you embrace them, it is impossible to ignore the basic lesson he presents: It is time to bring logic — not emotions — to bear on America's dilemmas. His spin on America in the 90's helps us to understand how simple the seemingly complex issues are. All it takes is looking at them from an entirely new viewpoint.

Now available in one complete volume, *Declare War!* is full of thought provoking ideas and solutions to some of the most difficult problems facing our country today.

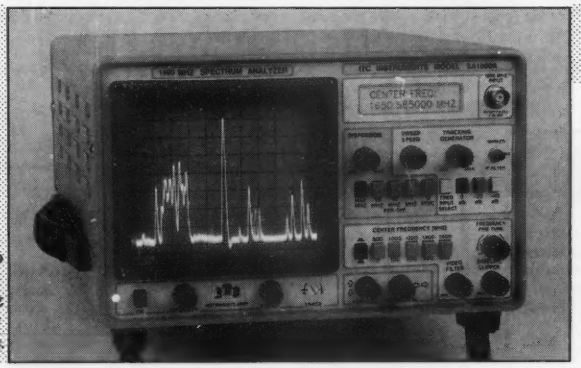


Regular price: $12.95

Special For *73* Readers Only—$10.00
(plus $3.50 shipping&handling)
Order Toll-Free: 800-234-8458

"ITC" The Only Affordable Spectrum Analyzer
THREE FULL FUNCTION ANALYZERS TO CHOOSE FROM 600 MHz - 1000 MHz - 1800 MHz

80 dB ON SCREEN DYNAMIC RANGE. With ITC's Exclusive EFPLA Log Amp. (pat.pend.)
-110 dBm SENSITIVITY AT ALL SPAN WIDTHS. ITC Analyzers have -110 dBm .7uv. sensitivity at all Resolution Band & Span widths.
HIGH STABILITY (<1KHz per Hr. after warm up)
FEATURES Baseline Clipper, Video Filter, 5"CRT, Preset plus variable Dispersion settings from 0 - 50 Mhz per/div, 100:1 tuning ratio for easy Center Frequency selection, & More.



PRICES START AT
$1295.00

A MUST FOR:
CHECKING CARRIES
SSB-AM-FM-RTTY-TV-PACKET
TWO WAY RADIO SERVICE
CHECK FCC REQUIREMENTS
TUNE CAVITIES, FILTERS
CHECK RF CABLES, AMPS
EVALUATE ALL RF SYSTEMS

FALL DEMONSTRATOR SALE *Like New One Full Year Warrantee*
SA1800A Opt.s 1,3,5,6 $1895.00 - SA1000A Opt.s 1,3,5,6, $1495.00
Limited to Stock on Hand - These Are Current Production Models - SAVE UP TO $1075.00

ITC INSTRUMENTS
9222 Chesapeake Dr. Suite A
San Diego Ca. 92123 USA
MADE IN THE USA
TERMS: M/C, VISA, AE, CHECK, MO, COD, P.O. (OAC)

SA600A 600 MHz $1295.00 Opt.1 50 MHz marker $200.00
SA1000A 1000 MHz $1595.00 Opt.3 +/- 5 KHz Filter $350.00
SA1800A 1800 MHz $1895.00 Opt.5 Tracking Gen. $250.00
Opt. 6 Center Frequency Display $275.00

FOR MORE INFORMATION & SPECIAL SALE PRICES
CALL 1-800-232-3501 619-277-4619 FAX-277-6736

ITC Analyzers are the perfect low cost choice for All AM, FM, SSB VHF, UHF, TV, PAN ADAPTER HAM RADIO NEEDS. You will save time & money with an ITC low cost Spectrum. Analyzer.

CIRCLE 112 ON READER SERVICE CARD

that others can see what they are missing.

If anyone has any questions, please contact me: Walery Sawka KB2FIV, Box 290, New York City NY 10028.

OKINAWA JAPAN

David Cowhig 7J6CBQ/WA1LBP
AmCon Naha
FBU PSC 556, Box 840
FPO AP 96372-0840

June brought Telecom Week and a demonstration of satellite communications, packet radio, ham TV, ham facsimile using the old NEC mini-fax machines available cheaply here, and eyeball rag-chews in Urasoe City. The packet radio stations used the DX-TERM Japanese language packet radio software which automatically switches into the display mode when it hits a NAPLPS videotext message on packet radio. It was very startling to be watching the kana and kanji of a Japanese packet message moving up the screen when suddenly the computer started to draw a full-color cartoon or map. You have probably seen videotext pictures on the news or weather bulletin channel of your local cable TV system. At the Telecom Week hamfest aspiring YL ham 10-year-old Toshitaka Ayaka, daughter of Toshitaka-san JS6KVP, told me she will take the August JARL ham class in Naha. A video-equipped Apple computer generated this picture of Ayaka, her 6-year-old brother Tsutomu, Toshitaka-san JS6KVP and myself.

NAPLPS attracted many followers in Japan, where drawing cartoons is a very popular hobby. *CQ Ham Radio*, Japan's biggest ham magazine, runs works of art by ham cartoonists every month. Some of these images make it onto the Japanese packet radio and landline computer networks as NAPLPS images. NAPLPS image files are a series of graphics commands which the receiving computer executes to draw a picture. A nice drawing can be sent in a file of 1 or 2 kilobytes' which would require 50 kilobytes or more if sent as a bit-mapped image. You can find NAPLPS software such as NALPVIEW.ZIP and other series of NAPLPS programs in ZIP files beginning with NALP written by enthusiastic Japanese hams such as Roy JM1VSP Kurashima Akihisa on the AMRAD BBS (703) 734-1387, or the Virginia Connection BBS (703) 648-1841 with its super-fast modem. Looking at this collection of pictures and playing with the software will give you an idea of what NAPLPS is like. I translated the documentation from Japanese several years ago. Creating a good NAPLPS file is hard. I would like to blame NAPLPS but the real problem is that I am not an artist.

I hope that all hams throughout the world are enjoying learning about the Okinawan culture and life. My fellow hams on the island are certainly enjoying seeing their news in *73*.

Photo B. Computer-generated picture from Okinawa.

PHILIPPINES

Lorenzo D. Gaston DU1CHD/6
PO Box 27
6116 Silay City, Neg. Occ.
Philippines

DX stations who wish to operate temporarily during their stay in the Philippines must apply for a reciprocal license before bringing their transceiver(s) into the Philippines. Section IX of the Philippine Amateur Radio Regulations states that "The NTC may authorize a person who is a resident and citizen of a foreign country to operate his or her amateur station while temporarily in the Philippines provided he or she is a holder of an appropriate amateur station license and an operator's license or certificate issued by the government of the country of which he or she is a citizen and provided that the same country has a formal or an informal reciprocal agreement with the Philippines. He or she should be encouraged to affiliate with a local amateur club for better camaraderie and fellowship." All reciprocal license callsigns have their original call suffixed by the word "portable" or "mobile," followed by the appropriate DU district number (from /DU1 to /DU9 only, no /DU0). For example, N1BAC will sign N1BAC/DU6 or DU6/N1BAC in Negros Island (IOTA OC-129) when he goes on a DXpedition here. *[I'm ready, Wayne! When do we leave?—Arnie]* NTC Reciprocal Licenses are usually issued with a maximum effectivity period of one year and can be renewed 30 days before the date of the expiration of the license.

The following documents are required when applying for an NTC reciprocal license: (1) Application letter stating your request to apply for a reciprocal; (2) Reciprocity agreement or informal agreement with the Philippines. Either document should come from your country's amateur licensing authority, certifying that it has issued or will issue an amateur radio reciprocal license to citizens of the Philippines who are holders of Philippine Amateur Radio licenses and/or certificates to be able to operate his or her amateur radio station with appropriate privileges while in your country; (3) A certified copy of your license; (4) A list of the transceiver(s) (brand, model, and serial number) you plan to bring to the Philippines; and (5) Certification from your country's amateur radio licensing authority stating it has no objection to your operating your amateur radio station in the Philippines.

COLLINS 208U-3A

2.5 KW POWER AMPLIFIER for 2 29.9999 MHz SSB-AM-CW using 4CX5000A tube. RF input 25-100 MW for rated output; auto-tune capable. Includes URG-II compatible control modules and most manual copies. Requires 200-250 VAC 3 phase 30 A; 73x33x31, 1020 lbs sh. **USED-not tested** less 4CX5000A **$4200**

GRR-18/GRT-17 RECEIVER-EXCITER GROUP, separate Rx and exciter racks with URG-II Series modules for use with 208U-3A. Also C-8364 dual control panel for frequency and mode functions. With manual copies except for C-8364. Requires 115 VAC 60 Hz; 200 lbs sh. (UPS 4 pkgs). **USED-not tested** **$900**

F-197/U BANDPASS FILTER for 205-225 Mhz band; twin gold-plated tunable cavities each with N-connection. 7x2.5x9.5, 8 lbs sh. **UNUSED** **$30**

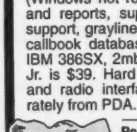
Prices F.O.B. Lima, O. • VISA, MASTERCARD Accepted. Allow for Shipping • Write for latest Catalog
Address Dept. 73 • Phone 419/227-6573 • Fax 419/227-1313

FAIR RADIO SALES
1016 E. EUREKA • Box 1105 • LIMA, OHIO • 45802

CIRCLE 75 ON READER SERVICE CARD

PC POWER FOR YOUR SHACK

LOGic™ 3 *The ultimate in amateur radio management software!*
Complete logging--HF, VHF, satellite..., online tracking for any award, QSL management w/ QSL route facility, radio interfacing controls rig and logs VFO data, antenna rotor control, data terminal for all digital modes, unequaled packet spotting for DXCC *plus* zones, prefixes, and more, contesting with user-specified contest rules, full mouse support, windowed interface (Windows not required), customizable screens and reports, superb documentation and tech support, grayline propagation chart, interface to callbook databases, and much more. Specs: IBM 386SX, 2mb RAM. LOGic 3 is $79. LOGic Jr. is $39. Hard drive required. QSL route list and radio interface hardware available separately from PDA. Visa/MC. **Free Infopak!**



Personal Database Applications, Dept 7, 2616 Meadow Ridge Dr, Duluth, GA 30136. Ph 404-242-0887. Fax 404-449-6687. Tech supp 404-417-1899. Hours 8 am - 6 pm M-Th, 8 - 12 Fri.

Now! A full-size antenna with low SWR from 50 to 1300 Mhz. The FLYTECRAFT™ Model KFN

- **Model KFN features low-angle radiation and low SWR across the full range.**
- **Large capture area** ~ antenna is 6 ft. tall and 54 in. across.
- **Heavy-duty construction, yet light in weight and windloading.**
- **Rated 500 watts, 50 ohm input impedance, S0239 connector, type N optional.**
- **Quick assembly, ideal for indoor and outside use.**
- **Futuristic appearance.**

Based on the design of our popular CFN, in use the world over.

Built with pride & sold worldwide ~ FLYTECRAFT™ USA

FLYTECRAFT™ Model KFN ~ $99.95
Send Check or $ Order to: FLYTECRAFT™ P.O. Box 3141 Simi Valley CA 93093 ~ Shipping Additional
VISA/MC PHONE ORDERS Satisfaction Guar.
800-456-1273 M-F 9A-5P (PT) 805-583-8173

CIRCLE 251 ON READER SERVICE CARD

The NTC, in the future, may also require other documents or may not require all of the documents listed above, so please write to the Philippine Amateur Radio Association for the latest requirements months before visiting the Philippines. The address is: PARA Secretariate, G/F Remedios Bldg., 55 A. Roces Ave., 1100 Quezon City, Philippines. The phone numbers are 96-40-69 and 98-47-05.

73, DU1CHD/6.

TAIWAN

Tim Chen BV2A
PO Box 30-547
Taipei, Taiwan
China

Hello, everybody! I would like to submit this statement about our activities and the progress of ham radio on this island to the readers of *73* magazine.

All hams are delighted to hear the long-awaited announcement that the Chinese Taipei Amateur Radio League (CTARL) has become the 126th member society in the International Amateur Radio Union (IARU) and its Region III since October 30 and November 7, 1992, respectively. We tried hard over the past years to obtain those very memberships. We are grateful to all those societies over the world for favoring us the votes (71 votes without a nay, unanimous!). We are encouraged and believe that we will have more and closer relationships and cooperation with all concerned in the future.

There was a celebration party held in the Mandarin Hotel, Taipei, on December 12, 1992. Not less than 400 hams and guests were present, and the buffet dinner was served from the evening until midnight. Special guests attending were Legislator Y. S. Lin; Mr. C. Y. Chen, Director of Post and Telecommunications Department, M.O.C.; Mr. Chen Yen, Division Chief of International Department, M.O.F.A.; and many other VIPs.

In April, the government's examination for ham operators will take place in central Taiwan—Taichung City. We are expecting 2,000 or more candidates and those passing will turn out 700 more new stations at the end of the year. The continuing growth of hams will make it possible to hold two examinations every year, beginning in 1993.

CTARL members in Taipei, Taiching, and Kaohsiung cities are in full swing, organized to serve the newcomers. Usually they supply cold drinks, stationery, and code practice for the last dash at the venue at no charge.

The CTARL is going to re-elect the second-term directors and president. I will be retired from CTARL service, but will never cease to be a ham. All visitors from abroad should call as usual if they happen to be in Taipei.

Next month I will report on the expedition to initiate the first BV9 on Quemoy Island. 73

Amateur Software and Hardware for the Commodore User

ART-1

ART-1: A complete interface system for send and receive on CW, RTTY (Baudot & ASCII) and AMTOR, for use with the Commodore 64/128 computer. Operating program on disk included. **$199.00**

AIR-1: A complete interface system for send and receive on CW, RTTY (Baudot & ASCII) and AMTOR, for use with Commodore VIC-20. Operating program in ROM. **$99.95**

AIR-1

SWL

SWL: A receive only cartridge for CW, RTTY (Baudot & ASCII) for use with Commodore 64/128. Operating program in ROM. **$69.95**

AIRDISK: An AIR-1 type operating program for use with your interface hardware. Both VIC-20 and C64/128 programs on one disk. **$39.95**

AIR-ROM: Cartridge version of AIRDISK for C64/128 only. **$59.95**

AIRDISK

MORSE COACH

MORSE COACH: A complete teaching and testing program for learning the Morse code in a cartridge.
For C64 or C128. **$49.95**
VEC SPECIAL **$39.95**

G AND G ELECTRONICS
OF MARYLAND

8524 DAKOTA DRIVE, GAITHERSBURG, MD 20877
(301) 258-7373

CIRCLE 169 ON READER SERVICE CARD

ORLANDO HAMCATION
P.O. Box 547811
Orlando, FL
32854-7811
Tel. (407) 657-9052

Get Ready!
for the
1994 ORLANDO
HamCation
and Computer Show

FEB. 18, 19, & 20 ORLANDO, FLORIDA
AT THE CENTRAL FLORIDA FAIRGROUNDS
ARRL
SOUTHEAST DIVISION CONVENTION

- Awards Every Hour Saturday & Sunday!
- Forums Galore!
- Hundreds of Swap Tables!
- License Exams!
- Computer Award on Saturday!
- Radio Award on Sunday!
- Saturday Fox Hunt with Award!
- Biggest Tailgate Section in Florida!
- Over 100 Acre Facility!
- Area Attractions Close By!
- Over 130 Commercial Exhibitors!
- Ladies Programs!
- Good Food! Great Weather!
- Free Parking!
- Welcome Talk-In on 146.76

CIRCLE 96 ON READER SERVICE CARD

NEVER SAY DIE

Continued from page 4

my own enthusiasm, and you probably could care less about music. Well, that's a shame to miss seeing or hearing beauty. It's probably too late now. Your parents should have opened the worlds of music, art, and books to you. Yeah, art. I've been in every major art museum in the world and have just about every book on Hopper's paintings ever published. Did I tell you about the time I was working on a Guggenheim grant at the Guggenheim Museum on Fifth Avenue? Probably did.

Say, I'm beginning to ramble like Old Indiana Jones. Have you been enjoying the summer Indiana Jones series? I particularly enjoyed the one where he met Sri Krishnamurti. I've always enjoyed K's books and used to go to his lectures in New York. I liked his philosophy, which they got across nicely in the Young Indiana Jones program. I suppose religious fanatics might be upset by his ideas.

Speaking of religion (a no-no), a recent *Newsweek* had an interesting article about the latest scientific ideas on how life got started. I was pleased to see that there are more and more scientists leaning toward the Hoyle theory. I think I mentioned Hoyle's book, *Evolution From Space*, sometime back. I like things to make sense, and this does.

If I can make some time I'd like to start doing a series of audio tapes which would discuss the music, books, amateur radio, and other things I'd like to share with others. A few die-hards got irritated with me at Dayton because I didn't talk about amateur radio the whole time. Heck, I talked for two hours and was only barely started. I did talk about my concerns about the ability of us continuing to keep our priceless frequencies without giving anything much in return as a quid pro quo. But then I've been writing about that theme for years. I'd like to get around to more hamfests to talk, but between music and computer shows, plus a little work to do around here, I've boxed myself in. If I get some spare time I'd like to organize my library and get the barn in better shape. And maybe chase a little DX. I was having fun on 10m until the sunspots killed it.

As soon as I can get set up with a remote transmitter system I'll be looking for duplex contacts . . . mostly on 20m. Oh yes, don't forget, if you talk to JY1, pass along my regards, and tell him I'd like to help him get his educational system out of the basement. Jordan has the only school system they've measured that's worse than ours. We're talking world-class bad, which is a real shame. That's a terrible legacy for his people. The bright side is that their kids are only just a little dumber than ours. But we're working diligently on dumbing our kids down even more, so who knows.

Now, please don't forget to write. Let's at least see a QSL with a rating for a book, gadget, or kit.

Ham Club Responsibilities. How Does Your Club Shape Up?

In my reports to the New Hampshire Economic Development Commission and our humongous citizen's legislature, I was expressing my frustration at their allowing excessively lousy overpriced schools, ridiculously expensive health care, poverty, rampant crime, drugs, and so on to continue . . . while there are some practical, inexpensive solutions to all these problems. I happened to look up the word "civics" in my dictionary. Check it out, since it applies to our beloved hobby, too. "The division of political science dealing with the privileges and obligations of citizenship."

It's the quid pro quo bit again. If you want to enjoy the privileges of citizenship, then you must fulfill your obligations. You can mull over the many privileges you enjoy as an American citizen, then start considering how well you're handling your attendant obligations. Like being an informed voter, for instance. If you were informed, you wouldn't keep sending the same old crooks to Congress, term after term . . . and then ask for term limits to stop you from doing this.

So, what has this to do with amateur radio? The quid is our privilege of using billions of dollars worth of frequencies as our playthings. The quo is our obligation to provide something in return, other than abuse.

What should we be doing? Well, we're supposed to be a technical hobby . . . a training ground for youngsters . . . and for each other. Considering the complications of technology today, it's difficult for us to become experts on everything. This is where our clubs can help. Suppose every club meeting started off with a technical talk by one of the members. One might explain how RTTY works. Another about SSTV. Others could explain about packet, satellite communications, aurora, moonbounce, fox hunting, and so on. You might assign club members the responsibility to learn about spread spectrum, digital radio, digital video, compression algorithms, fractal compression, orthogonal frequency division multiplex, and so on . . . and then have them explain these concepts to the club. Many hands make light work and it's exciting to learn new things. You might even find more hams coming to club meetings, and more getting interested in trying new modes and bands.

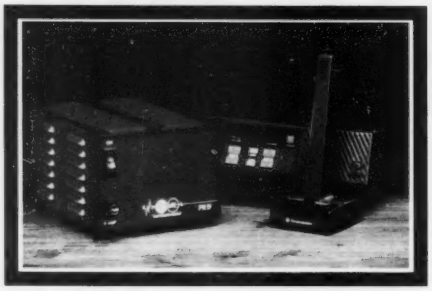
I keep reading all of the ham club newsletters I get, hoping to see signs that some of our clubs are taking our obligations as hams seriously. I'm not encouraged. How about your club? Let

Continued on page 82

TRIPP LITE DC POWER SUPPLIES: YOUR KEY TO GREAT COMMUNICATIONS!

According to 73 Magazine, it's performance that "never misses a beat."

PR Series DC power supplies are ideal for powering practically everything in your ham shack, including low band rigs, 2 meter and UHF radios.



Tripp Lite gives you:

- Great looks and high performance
- Crowbar protection
- Excellent regulation and line noise isolation
- Units available from 3 to 60 amps
- Competitive prices

Sample a unit today! Call and ask for Department HM1.

TRIPP LITE EST 1922
"THE POWER PEOPLE"

500 N. Orleans, Chicago, IL 60610-4188
(312) 755-8741 • FAX (312) 644 6505

70 YEARS OF MANUFACTURING EXCELLENCE

CIRCLE 255 ON READER SERVICE CARD

Why buy a TNC?
PC HF FAX + PC SWL $179.00

SPECIAL COMBINATION OFFER

For a limited time, if you order PC HF FAX $99 (see our other ad in this issue), you can add our new and improved PC SWL 3.0 for $80.00 instead of our regular low price of $99.00.

PC SWL contains the hardware, software, instructions and frequency lists needed to allow you to receive a vast variety of digital broadcasts transmitted over shortwave radio. All you need is any IBM PC or compatible computer and an SSB shortwave receiver. The product consists of:

Demodulator
Digital Signal Processing Software
200 Page Tutorial Reference Manual
World wide Utility Frequency List
Tutorial Audio Cassette with Samples

PC SWL automatically decodes Morse code, RTTY, AMTOR, SITOR, NAVTEX and ASCII.

PC SWL lets you tune in on world press services meteorological broadcasts, ham radio operators, coastal shore stations, aviation telex and much more digital action on the shortwave bands. Why pay for another expensive box when a simple interface and your PC can do the job?

ADVANCED FEATURES:

Tuning Oscilloscope
Digital Waveform Presentations
Auto Calibration and Code Recognition
Continuously Tunable Filter Frequencies
Variable Shift
Adjustable CW Filter Sensitivity
Unattended Capture and Printing
Integrated Text Editor
Integrated Log and Database
Shell to DOS applications
Seamless Integration with PC HF Facsimile

Call or write for our complete catalog of products.
Visa & MasterCard welcome.

Software Systems Consulting
615 S. El Camino Real, San Clemente, CA 92672
Tel:(714)498-5784 Fax:(714)498-0568

CIRCLE 244 ON READER SERVICE CARD

ADVERTISERS

R.S.#	page
• A & A Engineering	64
• A & A Engineering	65
18 A.S.A.	69
18 A.S.A.	62
351 Absolute Value Systems	69
164 Ace Communications of Indianapolis	54
• Action Communications	27
• Advanced Electronic Applications	9*
281 Agrelo Engineering	55
67 Alinco Electronics	59*
194 All Electronics Corporation	83
• Alphalab	93
29 Ameco Corporation	25
368 Antennas West	33
107 Antennas West	37
336 Antennas West	53
380 Antennas West	66
135 Antennas West	90
296 Antennas West	91
319 Antennas West	92
89 Antennas West	93
16 Astron Corporation	23
27 Avcom of VA	33
• Azden Corporation	45
21 B & B, Inc.	41
41 Barry Electronics Corporation	19
42 Bilal Company	41
273 Boyd Electronics	16
56 Buckmaster Publishing	69*
168 Buckmaster Publishing	93*
7 Buckmaster Publishing	41*
• Burghardt Amateur Radio	15
• Butternut Electronics	27
222 Byers Chassis Kits	69
184 C & S Sales, Inc.	65
• Cable X-perts	16
• CB City International	77
• Cellular Security Group	65
265 Chipswitch	77
99 Communication Concepts, Inc.	92
10 Communications Specialists, Inc.	75*
268 Computer Automation Technologies	63
12 Connect Systems	2
146 Creative Control Products	16
• **Digiteq**	**37**
• Down East Microwave	58
114 E. H. Yost	64
• Eavesdropping Detection	77
• Electronic Distributors	63
• Electronic Distributors	75
8 Elktronics	93
• Engineering Consulting	74
• EUR-AM	17
75 Fair Radio Sales	78
33 FB Enterprises	82
118 Flytecraft	17
251 Flytecraft	78
329 For Hams Only	**37**
169 G & G Electronics	79
193 GGTE	58*
291 Gracilis	74
192 Grapevine Group	91
• *Hambrew Magazine*	51
• Hamtronics, Inc.	7
331 Hardin Electronics	73
187 Harlan Technologies	37
284 Heights Tower Systems	57
• **Highlands Electronics**	**41**
293 IC Engineering	69
179 Icom	CV2*
77 Interflex Systems	17
42 Isotron	41
112 ITC	77
295 Itech	17
175 J-Com	65
39 J-Com	92
55 J-Com	31
26 J.M.S.	17
133 Jade Products	92
240 Jan Crystals	90
159 Japan Radio	49
285 JPS Communications	43
• K-Comm	55
2 Kawa Productions	51
151 KDC Sound	66
• Kenwood USA Corporation	CV4
382 LDG Electronics	17
234 Lentini Communications	89
243 Luke Company	71
25 Madison Electronic Supply	51
• Meadowlake Corporation	17
86 MFJ Enterprises	11
160 Micro Computer Concepts	55
144 Micro Control Specialities	84
30 Micro Video Products	72
114 Mr. Nicad	64
248 MoTron Electronics	72
• Multifax	25
1 Number One Systems Ltd.	89
102 ONV Safety Belt	37
96 Orlando Hamcation	79
• P.C. Electronics	62*
• P.C. Electronics	70*
178 Pacific Cable Company, Inc.	41
68 Periphex	41
198 Personal Computer Repeater Controller	25
• Personal Database	78
249 Phillips Industries, Inc.	66
311 Pioneer Hill Software	90
394 PKT Electronics	91
145 QSO Software	71
147 R.L. Drake Company	47
110 Radio Amateur Satellite	54
153 Radio City	40
58 Radio Engineers	64
• *Radio Fun*	36
• RAI Enterprises	25
34 Ramsey Electronics	20-21*
171 RF Enterprises	91
377 Ron's CDROMS	**69**
134 Rose	90
254 Ross Distributing	52
• RT Systems	90
294 S&S Engineering	53
• SAMS	90
• Schnedler Systems	43
36 Scrambling News	33
• Sensible Solutions	25
167 Sescom, Inc.	31
• *73 Amateur Radio Today*	31
188 SGC Inc.	57
250 Software Systems	43
244 Software Systems	80
51 Spectrum Communications	83
183 Spectrum International	57
247 Startek	1
• Tejas RF Technologies	65
• Ten-Tec	13
• The Ham Center	55
384 The Ham Contact	87
384 The Ham Contact	41
384 The Ham Contact	53
131 The Ham Station	85
269 Tigertronics	47
299 Townsend Electronics	55
11 Transel Technologies	37
22 Tri-Ex	70
255 Tripp Lite	80
50 Tropical Hamboree	81
121 U.S. Cable TV, Inc.	37
• Uncle Wayne's Bookshelf	94,95
• Universal Radio	47*
• Vanguard Labs	31
259 Versatel Communications	93
104 Vis Study Guides, Inc.	91
191 W & W Associates	36
20 Wolfe Communications	92
• Yaesu Electronics Corporation	CV3
• Yaesu Electronics Corporation	5

Bold listings are 73's new advertisers this month.

*Advertisers who contributed to the National Advisory Committee (NIAC).

34th ANNUAL

TROPICAL HAMBOREE

AMATEUR RADIO & COMPUTER FAIR

ARRL FLORIDA STATE CONVENTION

FEBRUARY 5 - 6, 1994

DADE COUNTY YOUTH FAIR & EXPOSITION CENTER • MIAMI, FLORIDA

• Sponsored by Dade Radio Club of Miami, Inc.

• PROGRAMS & ACTIVITIES FOR EVERYONE • 200 + EXHIBIT BOOTHS • 800 + INDOOR SWAP TABLES
• FREE PARKING FOR 15,000 VEHICLES • 300 CAMPSITES WITH HOOK-UPS & LAUNDRY FACILITIES
• TWO ON-SITE LICENSE EXAM SESSIONS • DXCC FIELD CHECKING

FCC FORUM (Featuring Ralph Haller, Chief PRB)
INTERNATIONAL AMATEUR RADIO (Presented by Region II, IARU)
LIVE TUNERS DEMO (Presented by Gordon West, WB6NOA)
WORLD OF EXTRA TERRESTRIALS
LATEST DXPEDITION & DX FORUM (Presented by S. FL. DX Assoc.)
ARRL OPEN FORUM (Featuring Officers and Directors of ARRL)
AMATEUR RADIO PAST AND PRESENT (Harry Dannals W2HD, Pres. QCWA)
WHATEVER YOUR SPECIAL AMATEUR RADIO INTEREST... YOU WILL FIND IT AT HAMBOREE.

Registration: $5.00 Advance — $6.00 Door • Valid Both Days (Advance deadline Feb. 1) • Swap Tables: $20 ea., plus reg. ticket • Power: $10 per user. IF YOU HAVE NEVER HELD SWAP TABLES, CALL SWAP CHAIRMAN FRANK SULLIVAN 305-667-1047 TO CHECK TABLE AVAILABILITY BEFORE SENDING IN RESERVATION. • Campsites: 3 days (Fri., Sat., Sun.) $40.00 4 days (Thurs., Fri., Sat., Sun.) $55.00 (Prices quoted for tickets, tables & camping include tax)
Headquarters Hotel: Miami Airport Marriott — $69.00 Single, Double + Tax • Tel. (305) 649-5000 — Speak Only to Reservation Department and **Must** Mention "Tropical Hamboree" to Get Special Rate. Deadline Jan. 24, 1994 After deadline, special rates on room available basis only

TICKET, CAMP, TABLE PAYMENTS PAYABLE TO: DADE RADIO CLUB OF MIAMI, INC.
Mail to: Evelyn Gauzens, W4WYR, 2780 N.W. 3 St., Miami, FL 33125
EXHIBIT SPACE INQUIRY: Call 305-642-4139 or Fax: 305-642-1648

CIRCLE 50 ON READER SERVICE CARD

NEVER SAY DIE

Continued from page 80

me know if you run across any signs of life.

Psynce

What's been your contribution to the world . . . so far? It's probably just the result of another bit of deformed DNA, no doubt resulting from my father smoking before I was conceived (it was Fatimas then, but it was Camels that eventually killed him), but I've always had this weird urge to somehow contribute something to the world during my short visit. It has to be a genetic problem because I don't ever recall any philosophical discussions along this line with anyone in my family. Or theological either.

Progress seems accepted as being beneficial, so I've always been inclined to do what I could within my limitations to help the world progress. My contributions have admittedly been minuscule, but satisfying to me.

How about you? Have you a feeling on some level that you owe the world a little positive push, or are you satisfied to be just a taker?

There are plenty of things you could do which would put a little more positive spin on our world. It's probably too late to get you to learn to write so you can help others to find out about interesting things, or even just enjoy what your mind provides for them. But, being a ham, there are a ton of scientific areas you could research and help pioneer. You've got a basic understanding of technology which could be put to excellent use. If you don't, you should have. That's part of your ham responsibility. I hope you haven't been cheating on this.

One area wide open for scientific investigation, one which doesn't even have to be expensive to pioneer, is the field of subtle energies. I like the term. I recently attended a conference in Monterey on the subject and was impressed with the progress that's being made. But even more, I was excited to find that this is such a new scientific field that almost anyone can get into it and produce worthwhile data. Yet I only ran into one ham at the conference. Tsk.

Subtle energies? What'n hell are they? That's the great part . . . no one really knows much yet.

Scientists have always been uncomfortable with anomalies. They really hate extra sensory perception and psychokenisis. They hate 'em so much that most scientists refuse to acknowledge that anything of the kind exists. Pathological skeptics. Having had enough proof in my own life that some sort of instant communications is possible over large distances; having had enough fortune-tellers read my tea leaves with incredible accuracy; and having read a hundred or so books about other carefully researched cases, I've been impatient with scientists for so blindly ignoring all this data.

Reincarnation, the soul, past lives, out-of-body and near death experiences, UFOs, and so on are all scientifically unexplainable, despite endless detailed reports substantiating their existence. Of course one problem is the profusion of charlatans, both intentional and unintentional, taking advantage of the situation. Another is that even some of the better mediums fudge at times, trying to make up for the unpredictability of their gifts.

Despite the seemingly endless number of scams, many centered in La-La Land (aka Southern California), often dressed up in scientific-sounding baloney, down there somewhere there may be some important breakthroughs waiting for you to lift the right rock. As a registered skeptic I enjoy the hokum about scalar physics, subliminal tapes, hemisync tones, and so on. If you do get involved with this high weirdo stuff, try not to get swept up as a believer.

So I've put psy and science together to describe a still almost virgin field which is out there ready to be explored. Psynce. I like that better than pscience. If you can harness psy, you'll have it made. ESP, clairvoyance, psychokenisis. Wow! It'll be a lot easier finding out how this stuff works than trying to disprove it, where you have millions of people who've had psychic experiences to face. The last statistics I saw claimed that over 67% of Americans have had a psychic experience. So let's kick some sand in the face of the scientists who won't even try to explore psi and the other anomalies they're ignoring. My experience in Monterey is that you are not going to be alone.

Yes, there's a need for an honest communications medium . . . a publication . . . to help this new field develop. But with many of the potential ads being for unproved products and services . . . and I'm being very kind with that description . . . it's probably still a little early for a magazine. And where would I ever find people to honestly evaluate the products so we'd know what really works and what's baloney? Heck, science doesn't even have a clue as to how the placebo effect works.

So here's a field where the frontiers are still accessible. How does acupuncture work? How does ESP work? Where does herbal medicine fit in? Can rainmakers make rain? What about dowsing? There's a whole world of weirdness out there which needs honest investigation. So, if you have any pioneer spirit, and would like to contribute to the world, there's plenty to do.

Considering the state of scientific research today, you really couldn't ask for a better situation for the independent researcher. You see, the modern scientist's success is measured by the

CALL NOW! 1-800-377-2339

REPEATER MAPS

2M MAP NOW FULL COLOR!

Use the *QUICK-N-EASY REPEATER MAP* to find the repeater you are looking for! HIGH QUALITY laminated plastic card with map of your state (California residents specify North or South CA) with 2m repeaters on the front and other bands on the back. Because it's laminated, it's tough and rugged. YOU'LL LOVE IT!

$3.95 PER CARD

INCLUDES: 144 MHz 220 MHz 440 MHz 900 MHz 1.2 GHz

ORDER 3 CARDS FOR JUST $10

REPEATER MAPBOOK

NEW! 1993-94

INCLUDES: 10M, 2M 220 MHz 440 MHz 900 MHz 1.2 GHz

Our quality Repeater Maps are now available in book form! That's right, our new book includes all U.S. States, all Canadian Provinces, Mexico, Central America and the Carribbean! Maps show city location, repeaters, highways, ham dealers, and tourist information! PERFECT FOR TRAVEL! More than 175 pages!

ORDER TODAY! $9.95

NEW **REGIONAL REPEATER MAP GUIDES**

A whole new way to enjoy our map cards! The regional guide includes six laminated state cards, spiral bound for easy use. Very handy, and super for regional travel!

PLUS $1.00 S/H COLOR/LAMINATED $9.95

SETS AVAILABLE
#1- AK, WA, OR, ID, MT, NV
#2- AZ, CA, HI, NM, NV, TX
#3- CO, MT, ND, SD, UT, WY
#4- IA, KS, MN, MO, NE, OK
#5- AL, AR, LA, MS, MO, OK
#6- AL, GA, FL, LA, MS, TN
#7- KY, MD, NC, SC, VA, WV
#8- IL, IN, KY, MI, OH, WI
#9- DE, MD, NJ, NY, OH, PA
#10- CT, ME, MA, NH, RI, VT

QUICK-N-EASY SHORTWAVE

New book includes everything you need to know to have fun with shortwave radio! Great book for beginners and also experienced listeners

ORDER TODAY! $9.95

FBenterprises

23801 NW 1st Ave.
Ridgefield, WA 98642-8830
CALL TODAY! 1(800) 377-2339
Dealer Inquiries Welcome

CATALOG $2 REFUNDED WITH PURCHASE

CARD ORDERS ADD 50¢ SHIPPING

BOOK ORDERS ADD $3.00 SHIPPING

CIRCLE 33 ON READER SERVICE CARD

Number 25 on your Feedback card

DEALER DIRECTORY

DELAWARE
New Castle

Factory authorized dealer! Yaesu, ICOM, Kenwood, Ten-Tec, AEA, Kantronics, DR-SI Mfg., Ameritron, Cushcraft, HyGain, Heil Sound, Standard Amateur Radio, MFJ, Hustler, Diamond, Butternut, Astron, Larsen, and much more. **DELAWARE AMATEUR SUPPLY, 71 Meadow Road, New Castle DE 19720. (302) 328-7728.**

NEW JERSEY
Lodi

North Jersey's newest Two Way Radio and Electronics Dealer is now open. Sales of Ham, Business, Marine and C.B. two way equipment as well as Scanners, Shortwave, Electronic Kits, Antennas, Books, Cable Boxes and more. Friendly service and low prices. **Advanced Specialties, 114 Essex Street, Lodi NJ 07644. (201) VHF-2067.**

NEW JERSEY
Park Ridge

North Jersey's oldest and finest Shortwave and Ham Radio Dealer. Three minutes from Garden State Pkwy and NY Thruway. Authorized Dealers for AEA, Alpha Delta, Diamond, ICOM, Japan Radio Company, Kenwood, Vectronics, Yaesu, Ham Sales, Lee WK2T. **GILFER SHORTWAVE, 52 Park Ave., Park Ridge NJ 07656. (201) 391-7887.**

NEW YORK
Manhattan

Manhattan's largest and only ham Radio Store, also full line of Business, Marine, Aviation, Shortwave Radios and Scanners, and Cellular Phones and Beepers. Large selection of Books, Antennas, Test Equipment, coaxial cable and parts. Full Service Repair Lab on premises. Our 44th Year . . . We carry all major lines: MOTOROLA, ICOM, KENWOOD, YAESU, BENDIX-KING, ASTRON, AEA, SONY, PANASONIC, MFJ, CCTV CAMERAS AND MONITORS, BIRD WATTMETERS, FREQUENCY COUNTERS, SCANNERS, HYGAIN, VIBROPLEX, HEIL, CALLBOOK, ARRL, OTHER PUBLICATIONS. Open 7 days M–F, 9–6 p.m.; Sat., 10–5 p.m. Sun. 11–4 p.m. We ship *Worldwide*. Call, Fax, or write for information and prices. Your one Source for HAM and Business Radios . . . **BARRY ELECTRONICS, 512 Broadway, New York NY 10012. (212) 925-7000. FAX (212) 925-7001.**

OHIO
Columbus

Central Ohio's full-line authorized dealer for Kenwood, ICOM, Yaesu, Alinco, Japan Radio, Standard, AEA, Cushcraft, Hustler, Diamond and MFJ. New and used equipment on display and operational in our new 10,000 sq. ft. facility. Large SWL Department, too. **UNIVERSAL RADIO, 6830 Americana Pkwy., Reynoldsburg (Columbus) OH 43068. (614) 866-4267.**

PENNSYLVANIA
Trevose

Authorized factory sales and service. KENWOOD, ICOM, YAESU, featuring AMERITRON, B&W, MFJ, HYGAIN, KLM, CUSHCRAFT, HUSTLER, KANTRONICS, VIBROPLEX, HEIL, CALLBOOK, ARRL Publications, and much more. **HAMTRONICS, INC., 4033 Brownsville Road, Trevose PA 19047. (215) 357-1400. FAX (215) 355-8958. Sales Order 1-800-426-2820.** Circle Reader Service 298 for more information.

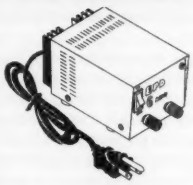
DEALERS: Your company name and message can contain up to 50 words for as little as $420 yearly (prepaid), or $210 for six months (prepaid). No mention of mail-order business please. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the April '92 issue must be in our hands by February 1st. Mail to *73 Amateur Radio Today*, 70 Rte. 202 N, Peterborough, NH 03458.

ALL ELECTRONICS

Courteous Service . Discount Prices . Fast Shipping

P.O. Box 567 • Van Nuys, CA 91408

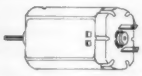
13.8 Vdc @ 6 AMPS POWER SUPPLY



Solid State, fully regulated 13.8 Vdc power supply. 6 AMPS constant, 8 amps surge. Features 100% solid state construction, fuse protection, LED indicator and automatic cutoff short protection.

$44.00 each CAT # DVP-612

3 Vdc MOTOR

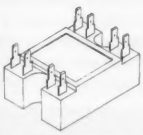


Johnson Motors # MF213G-2050
DC motor operates well at 1.5 Vdc to 4.5 Vdc.
0.72" X 0.94" X 1.38" long.
0.08" (2 mm) diameter shaft is 0.25" long.
LARGE QUANTITY AVAILABLE

CAT# DCM-42 **2 for $1.00**

150 for 40¢ each • 600 for 30¢ each

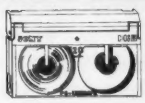
25 AMP SOLID STATE RELAY



Crydom# CSE2425-4626
Control voltage: 15-32 Vdc (will work 9-32 Vdc)
Load: 25 amps @ 48-240 Vac
Standard "hockey-puck" package,
2.25" X 1.75" X 0.85" high.
1/4" quick connect terminals. CAT# SSRLY-25A

$12.50 each

8 mm Video Camcorder Users! (USED) "HI-8" VIDEO CASSETTE



We have a new supply of these popular T-120 (120 minute) Hi-8 video cassettes. These are top quality, metal oxide cassettes that were used for a short time, then bulk-erased. Each cassette has its own plastic storage box. New, they would sell for considerably more than we're asking. We've sold thousands, and our customers love them.

10 for $28.00 **$3.00** each CAT# VCU-8

ORDER TOLL FREE
1-800-826-5432
CHARGE ORDERS to Visa, MasterCard or Discover

TERMS: Minimum order $10.00 Shipping and handling for the 48 continental U.S.A. $4.00 per order. All others including AK, HI, PR or Canada must pay full shipping. All orders delivered in CALIFORNIA must include state sales tax (7.25%, 7.5%, 7.75%, 8.25%, 8.5%). Quantities Limited. NO C.O.D. Prices subject to change w/out notice.

Call Or Write For A *Free* **64** Page CATALOG
Outside the U.S.A. send $2.00 postage.

MAIL ORDERS TO:
ALL ELECTRONICS CORPORATION
P.O. Box 567
Van Nuys, California 91408
FAX (818) 781-2653

CIRCLE 194 ON READER SERVICE CARD

For High Performance in Repeater Technology, Go with the Leader—

SPECTRUM

NEW! **S-7R Basic Repeater**

- "Stand Alone" or use with your controller

Inquire About Our *New* Low Cost S-7R Repeaters

- 10–40 Watt Units
- 2M, 222, 440 MHz
- Super Sensitive/Selective Receivers
- Unusually Good Repeat Audio
- Proven Performance throughout the World!

SCR1400
REPEATER W/150 WT. 2M Amp & 30A POWER SUPPLY.
(All items available separately)

NEW!

Shown in optional cabinet.

Call or write today for details and prices!
Get your order in A.S.A.P.
Sold Factory Direct or through Export Sales Reps. only.

For that new Machine—Spectrum makes 2 lines of Repeaters—the Deluxe SCR1400 and the new basic low cost S-7R line.

The S-7R Repeaters maintain the quality of design, components and construction which have made Spectrum gear famous *throughout* the world for years.

However, all of the "bells & whistles" have been eliminated—*at a large cost savings to you!* The S-7R is a real "work-horse" basic machine designed for those who want excellent, super-reliable performance—*but no frills!* For use as a complete "stand-alone" unit, or with a controller.

Of course, if you do want a Full Featured/Super Deluxe Repeater with Full panel metering and controls, and a complete list of 'built-in' options, then you want our SCR1400—the new successor to the "Industry Standard" SCR1000/4000.

Available with Autopatch/Reverse Patch/Landline Control; TouchTone Control of various repeater functions; 'PL'; "Emergency Pwr./ID; High/Low TX Power; Tone & Timer Units; Sharp RX Filters; Power Amps, etc.

- **Complete Line of VHF/UHF Rcvr. & Xmtr. Link Boards & Assemblies also available. Plus ID, COR, DTMF Control Bds., Antennas, Duplexers, Cabinets, etc. Inquire.**
- ***New—6m Receivers***

SC **SPECTRUM COMMUNICATIONS CORP.**

1055 W. Germantown Pk, S4 • Norristown, PA 19403 • (215) 631-1710 • FAX: (215) 631-5017

CIRCLE 51 ON READER SERVICE CARD

number of papers published. Being published results in grants, prestige, larger laboratories, and positions on decision-making committees.

One thing scientists know is that it is much easier to publish papers that don't challenge the present orthodoxy. As a result, few career scientists are interested in investigating anything which might cast a doubt on established beliefs. So they work over and over on smaller and smaller areas, and those generous grants keep acoming. The end result is that science today has lost its spirit of adventure . . . and that leaves a wide-open opportunity for the amateur.

If you look back on history, almost all of the major breakthroughs in science were made by amateurs. And most of them had to fight the entrenched scientific community of the day. It took years before scientists recognized the work of Max Planck and quantum mechanics. As Planck pointed out, his new theories were not accepted by the scientists of his day, it's just that eventually the old scientists died.

There are whole worlds of science (and psynce) that are wide open for anyone with the guts and a never-say-die attitude.

Saving Amateur Radio

In line with my normal gloom and doom approaches to our hobby, I fear that, perhaps by accident, someone will be appointed as an FCC Commissioner who has at least a slight grasp of communications and is not just reaping a political reward. As a result, the legitimacy of our exclusive rights to several billion dollars worth of public radio frequencies might be challenged. My proposition is simple: I suggest we spend a little time building at least a feeble leg to stand on should such a day of reckoning surprise us.

You might want to suggest this to your ARRL directors and see how far you get with them. Something like this might give you a hint as to how much of a voice you really have with the League.

Fortunately, past Commissioners in recent years have been too wrapped up with avoiding more mighty matters to notice us, so we've been sailing along in the foolish belief that it is our good works that have preserved our hobby. My thesis is that we'd better damned well re-invent our hobby before the Commissioners notice that we're no longer paying our dues.

I've been enjoying what is essentially another generous government handout . . . the use of our bands . . . but I keep wondering how long it's going to be before the piper comes around, wanting to be paid. One of these days some Japanese firm pushing a new satellite communications system is going to need some channels for the service and is going to start looking closely at all those lovely megahertz we're not using and figure which senators and congressmen will have to be bribed to get those frequencies more productively allocated. Less than one million dollars invested in the right congressional re-election campaigns could free up several billion dollars worth of channels. Our government is famous for outstanding bargains when it comes to congressional bribery. And who were some of the biggest collectors of these bribes in the recent past? Secretary Bentsen and VP Gore!

Hmm, come to think of it, I've been a registered lobbyist for around 20 years or so. Maybe there are some companies who'd like to have some help in getting tons of radio channels so they can sell the equipment to use them? No problem, I know exactly how to go about it.

In my past gloom and doom editorials I've suggested a new reason for our existence, other than the dubious proposition that well, we were a help many years ago. We have to remember that gratitude is one of the least felt of all human emotions and stop betting our whole hobby on it. I've recommended that we establish ourselves in the role which was so successful for us in the 1950s, as the major supplier to our country of high-tech career-oriented youngsters.

In line with this I've been encouraging ham clubs to not just accept youngsters, but to go out and get them. I've some further ideas along this line. I'd like to see the main club activity be the promotion of the hobby instead of just a meeting place for old-timers to kvetch about how bad the bands have gotten lately, what with all those lousy no-coders and everything, and how we need to raise the entry license to 50 wpm, not get rid of the code, and keep out the damned riff-raff.

In the days before the ARRL's Incentive Licensing proposal to the FCC, we had over 5,000 school radio clubs. Now we have only a few hundred left. So what I'm proposing as a major ham club activity is the re-establishment of school radio clubs, under the guidance of local ham clubs.

The school clubs should meet at least once a week. The youngsters would be invited to attend the local ham club monthly meeting where there would be show-and-tells on all of our main ham activities, such as DXing, CW, packet, RTTY, SSTV, repeaters, QRP, satellite communications, moonbounce, ATV, foxhunting, and so on. Then how about a short technical talk on AC, DC, tuned circuits, antennas, feedlines, and so on?

If there a half dozen schools in your area, each might have 20-30 members, and you might be able to get maybe 10 from each school club to come to your club meetings, if you keep 'em interesting. If we only got five new hams each per year out of 50,000 school radio clubs, we'd be adding

here is the next generation Repeater

MARK 4CR

The **only** repeaters and controllers with REAL SPEECH!

No other repeaters or controllers match Mark 4 in capability and features. That's why Mark 4 is the performance leader at amateur and commercial repeater sites around the world. Only Mark 4 gives you Message Master™ real speech • voice readout of received signal strength, deviation, and frequency error • 4-channel receiver voting • clock time announcements and function control • 7-helical filter receiver • extensive phone patch functions. Unlike others, Mark 4 even includes power supply and a handsome cabinet.

Call or write for specifications on the repeater, controller, and receiver winners.

Create messages just by talking. Speak any phrases or words in any languages or dialect and *your own voice* is stored instantly in solid-state memory. Perfect for emergency warnings, club news bulletins, and DX alerts. Create unique ID and tail messages, and the ultimate in a real speech user mailbox — only with a Mark 4.

Phone: #(508) 372-3442
FAX: #(508) 373-7304

MICRO CONTROL SPECIALTIES

Division of Kendecom Inc.
23 Elm Park, Groveland, MA 01834

2 meters 220 440

CIRCLE 144 ON READER SERVICE CARD

250,000 new hams a year to our hobby, and you'd make it much more difficult for me to zip down to Washington and sell out our bands to the highest bidder.

I wish I were exaggerating about how easy it would be to take hundreds of megahertz away from us. And just one attack like that could get the FCC to thinking about how much trouble we are and how little we offer in return for all that aggravation. The next thing you know, pffft. Say, who could we sell our old ham rigs to? I suppose we could put 'em up on 11 meters and join the happy HFers. Yet, considering the sophistication of today's direction finding technology, I dunno.

How much is your ham ticket worth to you? Would you sell it for $100, with the understanding that you'd never operate again? How about a $1,000? What's your price? Okay, I know you've got a price, so we're just haggling. Let's say that the average ham will sell out for $10,000. Then, how much would you be willing to pay to get a license? How much are your ham privileges worth to you?

Some DXers think nothing of spending $100 just to get a new country. We've had hams travel around the world making a business of this. No "donation," no QSL. I've been hamming for so many years I can remember when a "Green Stamp" was a dollar bill. Now, if you want that rare DX QSL you'd better enclose a $20 bill.

If your amateur radio license has a value for you, how much would you pay right now to preserve your privileges? Would you spend $10 a year? $50? $100? Yes, I know, you're a member of the League and they're supposed to be preserving the hobby. Other than threatening to sue the FCC every now and then, in what way are they doing this preserving? I haven't seen them doing diddly to get our crummy bands cleaned up. And that despite the creative ideas I've proposed to help them. Too much trouble, I guess. Let's wait until the FCC really gets fed up with the mess we're making and then sue them if they try to give our frequencies to some outfit willing to buy them via generous gifts to Congress.

No, I don't know of any other outfit doing what needs to be done either, despite there being several almost invisible "national" ham groups. And no, I'm not asking for donations. If I get a big need for money I can go to Sony and explain how for maybe as little as $20 million I can get them 20 MHz of choice microwave channels. Oh, make that $50m, they've got the bucks and I'll need a little extra to do the usual hidden video of my talks with Congress' best. That'll give me something to show at hamfests.

I suppose I'd better put a little disclaimer in here, just in case someone is dumb enough to think I'm serious. We don't give IQ tests as part of the license exam, so now and then I get some really weird letters. I'm often tempted to try and explain that at times I use irony, sarcasm, and even whimsy, to get across a point.

So no, I'm not here with my begging bowl in hand. But instead of asking you for money, I am asking you to cough up some time. Time to either get your local ham club to get into action or to put together a putsch and take the club over so you can get something done. Sure, I wish you'd con a few of your friends into getting *73*. If every reader recruited one more reader, we'd knock the socks off *QST*.

But I know what's going to happen. You're going to tell me you don't agree with everything I write and not chance any put-downs from friends who hate Wayne Green. Hate lovable old me? Lovable old "a spade is a spade" me? I suppose they're still mad at me for trying to get them to stop feeding that lard pile hanging over their belts, and trying to embarrass them into saying something of interest during QSOs.

Please let me know how you're doing on getting school radio clubs going, and send some pictures of the kids you con into trying our hobby. If I don't see pictures I'm not going to believe you're doing anything.

Extraordinary Science Conference

While I was attending a Subtle Energies Conference in Monterey (CA), I came across a promotion piece for a science conference in Colorado Springs. So naturally I zipped out to see what this was all about. The promotion promised all kinds of dumb science scams, but hey, if even one turned out to be worthy of investigation, it would be worth the trip.

The conference surprised me. First, the place was packed with hams. Wall to wall. They even had a ham rig set up and running, generating a comforting sideband garble in the background of their amplifier system for the speakers. Secondly, the hams weren't kooks. Third, some of the conference sessions were very interesting and well done. A couple of them almost got me excited. Alas, most of the rest were crackpots. I get annoyed when someone has this great invention . . . but darn, the prototype got busted on the way to the show . . . it was working just a few days ago. The chap then explains that he doesn't have any of those old letters after his name. After about one minute of talk I knew that anyway. Further, I knew right away that he'd never even bothered to learn the fundamentals of electricity.

So I sat through three days of poorly done videos and non-working demonstrations of preposterous machines. You start it with a battery and it'll generate a zillion watts of power. Sigh.

One of the bright spots was the opening speaker who talked about the experiences he'd had as a dentist with

KENWOOD

HAM STATION SPECIAL!!!

SAVE $$$

KENWOOD TH-78A
Dual-Band FM Transceiver

- Dual-frequency receive 2m/440
- Full-duplex cross-band operation
- Simultaneous receive (even on the same band!)
- 2.5W power with supplied battery pack
- 5W with 12 VDC power source
- Non-volatile memory (50 channels)

the HAM STATION

P.O. Box 6522
220 N. Fulton Avenue
Evansville, IN 47719-0522
Store Hours
MON-FRI: 8AM - 5PM
SAT: 9AM - 3PM
CENTRAL TIME

SEND A SELF ADDRESSED STAMPED (2 STAMPS) ENVELOPE (SASE) FOR NEW AND USED EQUIPMENT SHEETS.

WARRANTY SERVICE CENTER FOR: ICOM, KENWOOD, YAESU

FOR SEVICE INFORMATION CALL (812) 422-0252 MONDAY - FRIDAY

TERMS:
Prices Do Not Include Shipping.
Price and Availablity Subject to Change Without Notice
Most Orders Shipped The Same Day
COD's Welcome

MasterCard VISA DISCOVER AMERICAN EXPRESS

ORDERS & PRICE CHECKS
800-729-4373
NATIONWIDE & CANADA

LOCAL INFORMATION
812-422-0231
FAX 812-422-4253

CIRCLE 131 ON READER SERVICE CARD

amalgam fillings and nickel crowns. I'll try to get his book for you and make it available through Uncle Wayne's Bookshelf. If you, or anyone you know, has any fillings or crowns, you've better read this book ASAP: *It's All In Your Head* by Hal Huggins DDS. These could well be causing you all kinds of miseries. The 50% mercury in those fillings leaches out into your system. It's enormously poisonous and can cause Parkinson's, leukemia, multiple sclerosis, diabetes, and so on. Life is tough enough without your having a mouth full of poison feeding into your system. Touch a sensitive milliammeter to your tooth filling and your tongue and see how much current your tooth batteries are generating. And when a battery generates voltage, some of the metal in the battery goes where? Into you, that's where. So why doesn't the ADA stop dentists from putting in amalgam fillings? If they ever admit the liability it could cost dentists billions. So dentists are continuing to poison us.

One of the most interesting and visual of the talks was by Bill Wysock N6UXW, who showed off a Tesla generator which flashed sparks for about 10 feet. If you've got a few bucks and would like to experiment with ultra-high voltages, you might want to look up Bill.

I was disappointed that so few in the audience spoke up to point out that the speakers were ignorant about their subjects. But then, I didn't either. I didn't know how to ask questions of someone with a power generating device who wasn't really clear about the difference between a volt and a watt. Most of these characters were looking for money to finance their work.

But there were enough interesting ideas there to keep an inquisitive ham busy for months. And some ideas could be developed into practical devices. As I pointed out to some young hams who were watching all this with eyes bugging, all you have to do is spend a few weeks learning the basics of electricity and you'll be ready to tackle some of these projects. AC and DC theory isn't difficult. Nor are motors and generators. And learning is exciting.

I might not have zipped out to Colorado Springs for the conference if the Second Annual Boulder Ragtime Festival hadn't been on the same weekend. The two cities are only about an hour and a half drive apart, so I did the conference all day and then drove to Boulder for ragtime concerts at night.

Scott Kirby had driven up there from New Orleans, where he plays on the street. Scott's now being introduced as the foremost interpreter of Scott Joplin in the world. He draws standing ovations. He'll be giving some concerts in San José in November, and later at the Fresno Ragtime Festival.

The disappointing thing for me about many of the ragtime festivals is that most of the performers seem to pride themselves on discovering long-lost rags to play. The reason they were lost is that they never were any good. Like all popular music, only about 1% is worth hearing twice. But oh, that 1%! The good rags are fantastic and addictive, but I doubt there are much more than a hundred of them that are winners.

At the Colorado Springs Extraordinary Science Conference. Standing (left to right): Tony Chellemi KD6IFC, Covina CA; Bill Wysock N6UXW, Monrovia, CA; Rosalie Sorrell KD6KSG, Covina, CA; Skip Juhasz WB2UFV, Colorado Springs, CO; and Jim Hardesty N2DRT, Ithaca, NY. Seated (left to right): W2NSD; Mike Dipersio KC2Q, Bradley Beach, NJ.

So these performers exhume the dead and foul up the festivals. They're tired of playing Joplin's "The Entertainer" and "Maple Leaf Rag," but guess what the audience wants to hear? They want to hear the good stuff over and over. There are about 20 of Joplin's pieces that bring tears to my eyes. They're what I want to hear.

The other superb performer at Boulder was Frank French. I've got to get him up to my studio and do a few CDs for you of him playing Gottschalk and Nazareth, and doing some of his monologues. If I can get you to try my Kirby CDs and a couple of French, you'll see why I'll fly to San José and then drive to Fresno to hear them perform. Or to Boulder.

Kirby recorded "More Damned Good Rags" in my studio this summer, plus some of his own rags. And he's got some corkers.

Well, I had a great time at Colorado Springs at the conference and meeting the hams there, plus the concerts in Boulder. It was a great weekend. And if you old-timers would pay attention, you could meet me at things like this. You can buy a year's pass on Continental Airlines if you're over 62 . . . which most of you are by now. The pass costs about $2,000 and lets you fly once a week for a year. For $2,000 you can fly first-class all year. Yes, Continental flies to Dayton. So Sherry and I zip out to Las Vegas for the CES show, then Aspen for some skiing, and to various hamfests, electronic, computer and music shows. I have my Macintosh PowerBook with me, so I'm able to work wherever I am.

I've been under some pressure from friends to check into some networks, but I've avoided 'em so far. They can be time-consuming. Sherry checks into Prodigy, if you have any traffic for me. The new Prodigy rates seem to have their customers dropping out by the thousands.

Learn To Write

It's unfortunate that our schools don't teach kids to write. Oh, they can put a few words on paper, but that's not really writing. Writing takes some skill, and that means you need to learn how to do it. I don't recall ever being taught how to write, and I notice that the recent books about our school system have the same complaint. If you could see the mail I get you'd get a better idea of how poor American writing skills are.

Yes, it takes some practice and some education, but once you learn it is fun to write. I'll bet you have a book in you, if you'd just let it come out. So get a laptop computer and one of the cheaper laser printers and make it easy. I've tried a bunch of laptops and like the Mac PowerBook best. And they're available used for peanuts these days. I bought a 4/40 Model 140 for under a kilobuck. That's with 4 megs of RAM and a 40 Mb hard drive. That should handle anything you'll need. With it you can answer mail in a couple minutes. You can write spec sheets, ads, manuals, newsletters, and even that book. Maybe some articles for *73*? Once you try a laptop you'll never go back to a typewriter again. Or a pen.

An apology.

Apparently I have innocently offended one of the more militant homo-hams by my comments about homosexuality in my October editorial, in which I mentioned that I don't condone pedophilia . . . they're messing with children. The *W5YI Report* gaily leaped to defend homosexuality, writing: "Clearly, his behavior is abnormal . . . Green is to be pitied."

I'm not sure I've ever made any claims of being normal. I'm just not that deceptive. But no, I'm not normal. I don't sit home like most normal people, with a six-pack watching ball games on TV and eating pretzels. I don't even like beer, pretzels, or ball games. No one is going to call *that* normal, I hope. I apologize if I offended any child molesters with my editorial.

On the other hand, I sit on the bed and put my pants on both legs at the same time, just like everyone else, so there are many normal things about my life. And, like any true-blue ham, I've been active on OSCAR, have worked over 300 countries, helped pioneer NBFM, was an early user of SSB, RTTY, SSTV, and 6m, have made some unbeaten microwave records, have won all the bigger ham contests for my section, have DXpeditioned from dozens of rare countries, have done moonbounce work, have sat patiently through endless roundtables, have kerchunked thousands of repeaters, and have helped tens of thousands of hams pass the stupid code test with my superb code tapes, which I just happen to think are better than any others anywhere. Only my overweening modesty prevents me from telling you how great I think they really are.

Well, as they say, any publicity is good publicity, so I appreciate what at first glance seems like just one more wearisome Green-bashing attack by W5YI. I also appreciate the letters from other homosexual hams apologizing for the hysterical and unwarranted attack on me by a lone over-motivated gay activist.

One more thing . . . I do wish that W5YI would not encourage hams to sue hams, even though it makes wonderful grist for his pinko paper and no doubt sells subscriptions. 73

Lambda Amateur Radio Club

An International Organization Of Amateur Radio Operators
Officially Recognizes And Presents To

Wayne Green, W2NSD/1

This

Certificate of Appreciation

For his understanding of the difficulty gay and lesbian amateur radio operators worldwide face in gaining acceptance in the amateur community;
For his consistent encouragement and support of the efforts of the Lambda Amateur Radio Club to gain acceptance in the amateur community; and
For his assistance in LARC's struggle to promote the existence of the Club through paid advertising and his willingness to publicly support such efforts.

For these contributions to the continuing success of the Lambda Amateur Radio Club, the Officers and Members of the Club extend our heartfelt appreciation.

James L. Kelly, KK3K
President, LARC

Number 26 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by December 31. Provide a clear, concise summary of the essential details about your Special Event. Check ***Special Events File Area #11*** *on our* ***BBS (603-924-9343)****. for listings that were too late to get into publication.*

DEC 4

FARIBAULT, MN The annual Courage Center Handi-Ham Winter Hamfest will be held at the Eagles Club, starting with registration at 8:30 AM. Flea Market. Handi-Ham Equipment Auction. Talk-in on 19/79. Contact *Don Franz W0FIT, 1114 Frank Ave., Albert Lea MN 56007.*

DEC 5

HAZEL PARK, MI The Hazel Park ARC will hold its 28th annual Swap and Shop, from 8 AM-2 PM, at Hazel Park High School, 23400 Hughes St. Talk-in on 146.64- (DART). Contact *HPARC, Box 368, Hazel Park MI 48030.*

SPECIAL EVENT STATIONS

DEC 3-5

SAN ANGELO, TX The San Angelo ARC will operate Station W5QX to celebrate Christmas at Old Fort Concho, from 0001Z Dec.3rd-2000Z Dec. 5th. Frequencies: Lower General portions of 40, 20 and 10 meters. For a certificate, send QSL with contact number and a 9 x 12 SASE to: *W5QX, P.O. Box 4002, San Angelo TX 76902.*

DEC 4

FLINT, MI The Genesee County RC will operate W8ACW 1200Z-2400Z, to celebrate their 60th Anniversary. Operation will be in the General 80-15 meter phone subbands, the Novice 10 meter phone subband, and 2 meters. For QSL, send QSL and SASE to *GCRC, P.O. Box 485, Flint MI 48501.*

KALAUPAPA, HI Kalawao County will be on the air, with several SE Stations operating from the site of the Hansen's Disease Hospital, and the historic lighthouse. Phone, CW, and digital activities are planned for all bands, including the Novice subbands. Look for us at the lower portion of each subband. Listen for AH6IO, AH6IN, AH6KY, AH6KX, and others. For a commemorative QSL card, please send your card and an SASE to the home address of the operator contacted.

DEC 11

HOLLY, MI The Fenton Area ARA will operate KB8MBJ 1400Z-2400Z, during the annual Charles Dickens Festival. Operations will take place between 28.300/.500 MHz and in the General portions of the 20 and 40 meter phone subbands. For a special card, send your QSL and #10 SASE to *Bill Coale KB8MBJ, 605 S. Broad St., Holly MI 48442.*

DEC 11-12

TROY, NY The Troy ARA announces its 2nd annual RTTY Sprint. The contest period this year will be from 2100 UTC Dec. 11th-0100 UTC Dec. 12th. Scoring and bands will be the same as the ARRL RTTY Roundup. Logs should be submitted by Jan. 17th, 1994 to *Bill Eddy NY2U, c/o TARA, 2204 22nd St., Troy NY 12180.*

DEC 18

PERRIS, CA Hams of the Orange Empire Railway Museum will operate KC6TKT and other calls 1900Z-2359Z, to celebrate their annual North Pole Limited Steam Train operation. SSB: 28.330 MHz. For QSL, send QSL and #9 SASE to *OERM, P.O. Box 548, Perris CA 92572-0548.*

DEC 18-19

NAZARETH, PA The Delaware-Lehigh ARC will operate W3OK 1400Z-0200Z Dec. 18-19, from the twin Christams cities of Nazareth and Bethlehem PA. Frequencies: 3.965, 7.265, 14.265, 21.365, 28.365. For a certificate, send QSL and SASE to *DLARC, RD4, Greystone Bldg., Nazareth PA 18064.*

DEC 30-JAN 1

PASADENA, CA The Relay Repeater Club will operate Station WB6BNJ, from the Wrigley Mansion, Dec. 30th-Jan. 1st, from 1600Z-0200Z each day. Primary frequency will be 28.460 MHz. Secondary frequencies: 21.335 MHz and 14.260 MHz. This event is in conjunction with the 105th Anniversary of the Tournament of Roses. Amateurs in California/Nevada can contact the Station on 2 meters through the 147.21 repeater, on the half hour, or on 220 MHz, via the Condor Connection, on the hour. For a certificate, send a QSL, with contact number and a 9 x 12 SASE with 58 cents postage, to *Relay Repeater Club, P.O. Box 660081, Arcadia CA 91066-0081.*

Serving The LORD Since 1987

$49.95!

THE POWER STATION

The POWER STATION is a 12V x 6.5 AmpHr gel-cell battery complete with voltmeter, wall charger and a cord for charging via automobiles. It will power most HT's at 5 Watts for 2-4 weeks (depending upon how long-winded you are). Also VHF, UHF, QRP, or HF mobiles such as the KENWOOD TS-50 (at 50W). There are no hidden costs, all you need is your mobile, HT power cord or cigarette lighter adapter.

The POWER STATION provides 12V from a cigarette plug and has two recessed terminals for hardwiring. A mini-phone jack with regulated 3V, 6V, or 9V output can be used separately for CD players, Walkmans, etc. THE POWER STATION can be charged in an automobile in only 3 hours, or in the home in 8 hours. The charger will automatically shut off when the battery is completely charged, so you can charge it even when it has only been slightly discharged, (unlike Ni-Cads that have memory). Our charging circuit uses voltage sensing circuitry, other brands are timed chargers which always charge the battery a full cycle, this damages their battery and shortens its' life if it only needs a partial charge. The POWER STATION has a voltmeter that shows the exact state of charge of the battery, not worthless idiot lights that tell you ``YOUR BATTERY IS NOW DEAD.'' The voltmeter can even be used to measure voltages of other sources.

To order, send check or money order for $49.95 + $8.50 for shipping, along with your shipping address and telephone number to:

Joe Brancato
THE HAM CONTACT
P.O. Box 3624, Dept. 73
Long Beach, CA 90803.

CA Residents Add 8 1/4% Sales Tax. Candian Residents Please Send U.S. Money Order & $17.:0 Shipping.

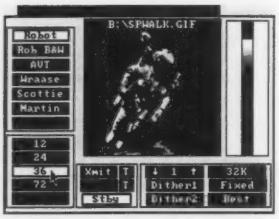
If you wish more information please send a SASE to the above Address. For COD orders, call (310) 433-5860, outside of CA call (800) 933-HAM4 and leave a message.

CIRCLE 384 ON READER SERVICE CARD

Number 27 on your Feedback card

NEW PRODUCTS

Compiled by Charles Warrington WA1RZW



ABSOLUTE VALUE SYSTEMS

A new full-featured receive-only SSTV system has been announced by Absolute Value Systems. The new SSTV Explorer is for enthusiasts who don't need transmit capability. This new system will receive most popular color modes and the compact interface plugs into a serial port with no extra power supply required.

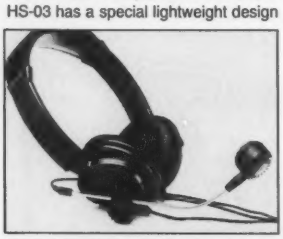
SSTV Explorer is priced at $94.95. The package includes the interface, manual, and software on a 3.5" diskette. (A 5.25" diskette is available upon request.) For hams who want to transmit as well as receive, Absolute Value offers Pasokon TV.

Pasokon TV Version 1.2 is a popular PC-based system with an interface that fits inside the computer. Features include an on-screen tuning indicator, a built-in test pattern generator, and automatic fine-tuning.

Pasokon TV can handle all popular SSTV transmission modes and is compatible with IBM 286 or later PCs, ATs, or clones with VGA color, one expansion slot, and 640K memory. The $229.95 price includes interface, software, and manual. For more information contact *Absolute Value Systems, 115 Stedman Street, Chelmsford MA 01824-1823; (508) 256-6907.* Or circle Reader Service No. 201.

AZDEN CORPORATION

A new headset with an attached boom microphone has been announced by the Communications Division of Azden Corporation. The Model HS-03 has a special lightweight design and an audio frequency range particularly well suited for communications applications.



The adjustable headband provides a perfect fit for all sizes. The padded earpieces cover the ear so outside sounds are reduced but not eliminated. Low frequency noise, such as power supply hum, and high frequency interference, such as hiss and static, are significantly reduced.

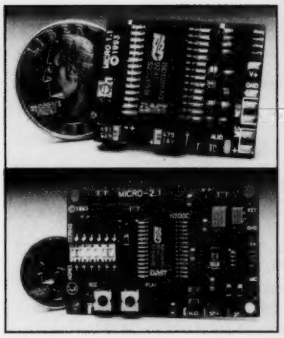
The price is $69.95 factory direct. For more information contact *Azden Corporation, 147 New Hyde Park Road, Franklin Square, NY 11010; (516) 328-7500, FAX (516) 328-7506.* Or circle Reader Service No. 203.

GORDON WEST

The Novice and Technician question pools, FCC Elements 2 and 3A, were revised in July 1993. One of the first updated books covering the new questions is the Gordon West *New No-Code* book, available through most ham radio dealers.

"What makes our book different from traditional theory guides is our question and answer format, along with my paragraph of description of why the answer is correct," says author Gordon West WB6NOA. "This allows students to prepare for their examination in the same exact order as the FCC syllabus." The new book contains more than just questions, answers, and descriptions. There are 50 pages guiding the new student through test-taking, preparing for the optional code test, filling out the FCC's Form 610, and locating nearby examiners. For discount classroom quantity prices, call (800) 669-9594. For more information contact Gordon West, c/o W5YI, P.O. Box 565101, Dallas, TX 75356-5101; (714) 549-5000 *Or circle Reader Service No. 207.*

AGRELO ENGINEERING



Agrelo Engineering has introduced two new micro-sized voice recorder identifiers. The Micro 1.1 is small enough to fit in a microphone at 1-1/4" x 15/16". The Micro 2.1 is slightly larger at 1-1/2" x 2-1/2". They are both capable of serving as amateur radio station IDers, beacons, contest identifiers, repeater identifiers, or as foxhunt teasers.

Both are designed around the ISD-2560 voice recorder chip, using direct analog storage technology. The chip eliminates any need for battery backup with its 100-year no-power retention. You can select either 60 or 16 seconds of record time. The circuit also has a 50 mW audio amplifier capable of driving a small speaker.

The Micro 2.1 has all the features of the Micro 1.1, but adds multi-function DIP switches, 5V key output, ID timer, and COR or squelch keying. The Micro 1.1 is priced at $69.95 for the 16-second model and $79.95 for the 60-second version. The Micro 2.1 is priced at $109.95 for the 16-second and $119.95 for the 60-second version. For more information or to order, contact: *Agrelo Engineering, 1145 Catalyn Street, Schenectady, NY 12303; Sales (800) 588-4300, Tech support (518) 381-1057, FAX (518) 381-1058.* Or circle Reader Service No. 205.

AEA

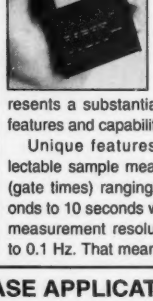
Advanced Electronic Applications has recently introduced two new products that allow you to remote control your HF station utilizing touch-tone technology: HamLink and RadioLink.

Hamlink uses a touch-tone telephone to control your rig. It allows you to change bands, adjust frequency, switch modes, scan, run split VFO, or control virtually any other feature. There is no need for a second phone line. HamLink works fine even if there is an answering machine on the line.

RadioLink is similar to HamLink, letting you use the touch-tone keypad on your handheld or mobile radio to control your HF base. RadioLink can go between your HF/VHF/UHF transceiver and a repeater or a 220 MHz or UHF full-duplex link.

A demonstration unit has been set up for people who would like to call and try it out. Call (800) 432-8873 and request a brochure with the telephone number and a list of commands. The suggested price for HamLink is $269; RadioLink is $329. For more information contact *Advanced Electronic Applications, Inc., P.O. Box C2160, Lynnwood, WA 98036; (206) 774-5554, FAX (206) 775-2340.* Or circle Reader Service No. 208.

OPTOELECTRONICS



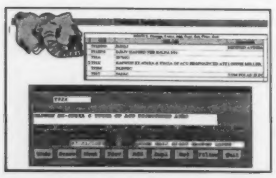
Optoelectronics Inc. has announced a new high-performance, pocket-sized addition to their line of "Handi Counter" frequency counters. The new Model M1 represents a substantial leap forward in features and capabilities.

Unique features include 10 selectable sample measurement periods (gate times) ranging from 13 milliseconds to 10 seconds with corresponding measurement resolution from 10 kHz to 0.1 Hz. That means the M1 is capable of both ultra-high-speed measurement and very high-resolution 10-digit measurement.

The heart of the M1 is the OE10, a high-speed ASIC (Application Specific Integrated Circuit) capable of 250 MHz direct counting. Special filtering greatly reduces any display of random noise and oscillation without sacrificing sensitivity.

The M1 is currently available from stock and priced at $229. It comes complete with NiCd batteries, a wall plug supply/charger, and a manual. For sales or information contact *Optoelectronics Inc., 5821 NE 14th Ave. Ft. Lauderdale, FL 33334; (800) 327-5912, FAX (305) 771-2052.* Or circle Reader Service No. 204.

PERSONAL DATABASE APPLICATIONS



The new PDA QSL Route Database is now available from Personal Database Applications. For only $10 LOGic users have long enjoyed the convenience of having thousands of QSL routes at their fingertips. Now PDA is offering this full-featured user-updatable list to all hams.

Data for the list has been compiled from information gathered by hams worldwide, who use LOGic to process their cards. The current list has 28,000 routes, with hundreds more being added each month.

The list includes DOS access software with full mouse support. The latest list is only $10, a one-year bi-monthly subscription is $35, and a one-year monthly subscription is $60. Software for Windows (3.1) is $10 extra. For more information contact *Personal Database Applications, Dept. DX, 2616 Meadow Ridge Dr., Duluth, GA 30136; (404) 417-1899.* Or circle Reader Service No. 206.

Number 30 on your Feedback card

BARTER 'N' BUY

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the Barter 'n' Buy, Judy Walker, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls.

The deadline for the January classified ad section is November 11, 1993.

ALL ABOUT CRYSTAL SETS. Theory and construction of crystal set radios. $7.95 each, ppd USA. Send to: **ALLABOUT BOOKS,** Dept. S, P.O. Box 22366, San Diego CA 92192. BNB200

CUSTOM MADE-HAND TOOLED leather products with your initials, name, call letters. Photo's & estimates available. Key rings, wallets, belts, purses, hanging signs, specialty items. Great X-Mas gift. **LEATHER & WEST,** 67 Causeway Rd., West Swanzey NH 03469. (603)352-6256. 9-4 pm. M-F ET. BNB215

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $12. LEARN MORSE CODE IN 1 HOUR. Amazing supereasy technique. $12. Both $20. Moneyback guarantee. Free catalog: SASE. **BAHR-T8,** 150 Greenfield, Bloomingdale IL 60108. BNB221

QSL CARDBOXES & INDEX DIVIDERS. Send SASE. **7-Mike HAMSTUFF,** P.O. Box 14455, Scottsdale AZ 85267-4455. BNB224

NO DSP AUDIO PROCESSING COMPARES TO JPS. Eliminate variegated noises. NIR-10 special, $329.95; NF-60 Notch Filter, $139.50. Satisfaction guaranty. Authorized dealer: **DAVIS RF CO. 24-HOUR ORDERS:** (800)484-4002, CODE 1356. FAX: (508)369-1738. BNB254

QLS SAMPLES- 50 cents. **SAMCARDS,** 48 Monte Carlo Dr., Pittsburgh PA 15239. BNB275

VHF, UHF, QUAD 4+ ELEMENTS: Parts list and assembly instructions for easy construction. Send $10 and SASE, **TODD KI6JE,** MB# 1029, Ridge Park Drive, Concord CA 94518. BNB285

COMMODORE 64 REPAIR. Fast turn around. **SOUTHERN TECHNOLOGIES AMATEUR RADIO,** 10715 SW 190th Street #9, Miami FL 33157. (305)238-3327. BNB295

RADIO RUBBER STAMPS free brochure. **REID ASSOCIATES,** 6680 Mellow Wood, West Bloomfield MI 48322. BNB297

WANTED ELECTRON TUBES, ICS, SEMICONDUCTORS. ASTRAL P.O. Box 707ST, Linden NJ 07036. Call (800)666-8467. BNB307

KENWOOD AUTHORIZED REPAIR. Also ICOM, Yaesu. **GROTON ELECTRONICS,** Box 379, Groton MA 01450. (800)869-1818. BNB310

RCI-2950 OWNERS: New modification manual including Power increase. Clarifier modification. Modulation increase. Operating hints, and more. Parts included. Only $20.00 ppd in U.S. (Missouri residents add $1.15 tax). **SCOTT,** P.O. Box 510408, St., Louis MO 63151-0408. (314)846-0252. Money Orders or C.O.D. BNB340

CONNECTICUT'S FAVORITE HAM STORE. ROGUS ELECTRONICS, 250 Meriden-Waterbury Turnpike, Southington CT 06489. (203)621-2252.BNB355

KIT BUILDERS! Complete list of 136+ kit vendors. SASE + $3.00 USD to: **RUTENBER ENGINEERING,** 38045 10th St. E. #H75, Palmdale CA 93550-AR. BNB365

QSL CARDS — Standard and custom. Your ideas or ours. Excellent quality. Foil stamping available. Many designs and type styles. Catalog and samples $1.00 refundable. **WILKINS,** Dept. A, Box 787, Atascadero CA 93423. BNB370

20 METER SUPERHET C.W. TRANSCEIVERS KIT, $49.95 plus $3.75 shipping. Check/M.O. 1994 Catalog for 2 Stamps. **DAN'S SMALL PARTS & KITS,** 1935 South 3rd West #1, Missoula MT 59801. BNB385

AMATEUR MARKET PLACE. New monthly newsletter listing for sale & wanted Amateur & Computer equipment. C$19.95 or US$16.50. US Hams reap value of $ exchange by buying **Canadian. CALE ENTERPRISES,** P.O. Box 8180, Ottawa, Canada K1G 3H7. BNB405

TOLL FREE 1-800-666-0908 PRICING AND ORDERS ONLY

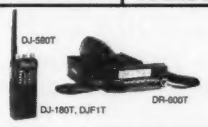
KENWOOD

CALL FOR ALL KENWOOD

YAESU

CALL FOR ALL YAESU RADIOS & ACCESSORIES

ALINCO



CALL FOR ALL ALINCO

ICOM

CALL FOR ALL ICOM

STANDARD

CALL FOR ALL STANDARD

AEA • ASTRON • AZDEN • COMET • CUSHCRAFT • DIAMOND • KANTRONICS
MFJ • SANGEAN • SONY SHORTWAVE • DRAKE • MANY MORE...

NEW EQUIPMENT PRICING AND ORDERS 1-800-666-0908 OUT OF STATE
TECHNICAL, USED GEAR, INFO 203-666-6227 24HR. FAX 203-667-3561

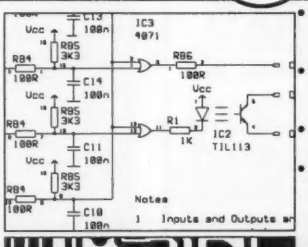
LENTINI COMMUNICATIONS INC.
21 GARFIELD STREET, NEWINGTON, CT 06111

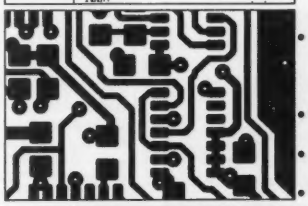
Hours: M-F 10-6, SAT. 10-4 — MasterCard VISA Discover — C.O.D.s OK — Same Day Shipping

CIRCLE 234 ON READER SERVICE CARD

PCB and SCHEMATIC C.A.D.

EASY-PC $195 EASY-PC





- Runs on PC/XT/AT/286/386 with Herc, CGA, EGA, VGA.
- Design Single sided, Double sided and Multilayer boards.
- Provides Surface Mount support.
- Standard output includes Dot Matrix / Laser / Inkjet Printers, Pen Plotters, Photo-plotter and N.C. Drill.
- Award Winning EASY-PC is now in use in over 17,000 Installations in 70 Countries World-wide.
- Much easier than Lightbox and tapes.
- SUPERBLY EASY TO LEARN AND USE.
- Not Copy Protected.

Options:- 1000 piece symbol library $75.00,
Surface Mount library $112, Gerber Import facility $195.00

For full info', write, fax, call or use Inquiry #

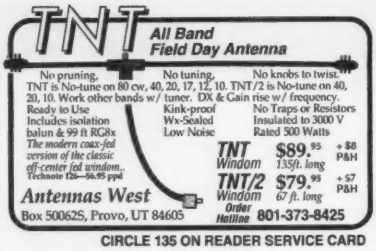
Number One Systems Ltd. 1

BRITISH DESIGN AWARD 1989

REF: 73, HARDING WAY, ST.IVES, HUNTINGDON, CAMBS., ENGLAND, PE17 4WR.

Telephone:	Fax:	
USA: (415) 968 9306	USA: (415) 968 9306	AMEX,VISA,
Intnl:- +44-480-461778	Intnl:- +44-480-494042	MasterCard
UK :- 0480 461778	UK :- 0480 494042	Welcome

CIRCLE 1 ON READER SERVICE CARD


TNT
All Band
Field Day Antenna
No pruning,
No tuning,
No knobs to twist.
TNT is No-tune on 80 cw, 40, 20, 17, 12, 10. TNT/2 is No-tune on 40, 20, 10. Work other bands w/ tuner. DX & Gain rise w/ frequency.
Ready to Use
Includes isolation balun & 99 ft RG8x
The modern coax-fed version of the classic off-center fed windom.
Kink-proof
Wx-Sealed
Low Noise
No Traps or Resistors
Insulated to 3000 V
Rated 500 Watts
TNT Windom $89.95 135ft. long +$8 P&H
TNT/2 Windom $79.95 67 ft. long +$7 P&H
Antennas West
Box 50062S, Provo, UT 84605
Order Hotline 801-373-8425
CIRCLE 135 ON READER SERVICE CARD

Amateur Radio Language Guide
- Hundreds of phrases, especially for the ham radio operator
- Vol. 1 - French, Spanish, German, Japanese, Polish
- Vol. 2 - Swedish, Italian, Portugese, Croatian, Norwegian
- Vol. 3 - Russian, Danish, Czech, Korean, Hawaiian
- Vol. 4 - Chinese, Dutch, Finish, Romanian, Vietnamese
- Vol. 5 - Hungarian, Arabic, Phillipino, Turkish, Indonesian

Send $10. per volume U.S., $12 outside U.S. to:
ROSE, P.O. Box 796, Mundelein, Il 60060-0796

Speak To The World

CIRCLE 134 ON READER SERVICE CARD

SAM AMATEUR RADIO CALLSIGN DATABASE 1994

Look up by CALL, NAME, City, State and Zip Code
Edit or Add Entries. Print Lists or Labels Comment field for personal notes
Direct interface to many popular logging and BBS programs
Requires MS-DOS, 17MB actual free hard disk, and High Density floppy for install.

SAM 1994 coming in December.

'94 VERSION ONLY $39.95

Semi-Annual Subscription $55.00 Quarterly Subscription $ 80.00

RT SYSTEMS, INC. POB 8. LACEYS SPRING, AL 35754

1-800-723-6922

Sell Your Used Gear In BARTER 'N' BUY
Call Judy Walker today. 1-800-274-7373

Why Take Chances?

HIGH QUALITY, GREAT PRICES, PLUS—

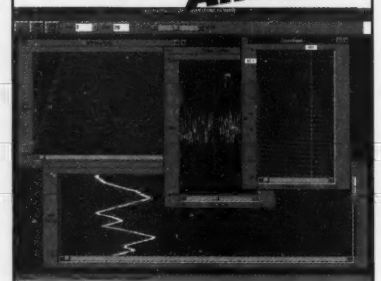
EXPEDITED ORDER SERVICE FOR:
General Communication • Industry • Marine VHF
Scanners • Amateur Bands • Microprocessor
Experimental

Get your FREE 1993 Catalog!
CALL TOLL FREE: 1-800-JAN-XTAL

JAN Crystals
P.O. BOX 06017 • Fort Myers, Florida 33906
(813) 936-2397

CIRCLE 240 ON READER SERVICE CARD

Advanced Spectrum Analysis



*New **Spectra Plus!** Examine audio signals in real time, or record and post-process from WAV files. View time-series, spectrum, color spectrogram, and/or 3D surface plots in separate, independent windows.*

***Spectra Plus** gives full control over FFT size, sample rate, scaling, gain, and averaging period.*

*Point and click to make a measurement, mark frequencies, and print results. **Spectra Plus** features advanced options such as triggering, smoothing window, overlap processing, and more. –And it's fast!*

Many applications... from audio equipment repair to speech, music, and modulation analysis.

Requires Windows 3.1® and any compatible 8- or 16-bit sound card. No programming required.

SpectraPlus *Price: $179, **Intro Special, $129** Demo disk, $4 (credit toward purchase) Spectra Lite, (spectra plot only) $39* S & H included. Foreign delivery, add $10

Visa, MasterCard, Check or Money Order to:

Pioneer Hill Software
24460 Mason Road ***1-800-401-3472***
Poulsbo, WA 98370 *FAX: 1-206-697-3472*

CIRCLE 311 ON READER SERVICE CARD

GREAT HAM LOCATION in beautiful PRESCOTT, ARIZONA. Telrex TB6, 55 ft. and 35 ft. towers. High quality 2300 sq. ft., 3 bedroom, two bath home with gorgeous views from every room. By owner, $199,900. (602)778-3370. BNB410

BROWNIES QSL CARDS SINCE 1939. Catalog & samples $1 (refundable with order). 3035 Lehigh Street, Allentown PA 18103. BNB430

QSL CARDS- Look good with top quality printing. Choose standard designs or fully customized cards. Request free brochure, samples (stamps appreciated) from: **CHESTER QSLs,** 310 Commercial, Dept. A, Emporia KS 66801. FAX (316)342-4705. BNB434

GREAT HOLIDAY GIFT! CopyCode. See page 64 August QST. KY6P. (619)453-9446. BNB450

INTERESTED IN PUBLIC SERVICE? Join REACT TODAY! For information write, **KA3PDQ, c/o REACT,** P.O. Box 8797, Allentown PA 18105. BNB465

QSL SAMPLES send $1 (refundable). Bud Smith, Box 1948, Blaine WA 98231. BNB475

BEAM HEADINGS-YOUR QTH AND THEIRS $5.95. KB7HM, 4204 Fox Point Drive, Las Vagas NV 89108. BNB505

CRYSTALS: High quality for your VHF/UHF and SHF transverter projects. SASE. **WA3IAC,** 7148 Montague St., Philadelphia PA 19135. BNB515

WE BUY NEW & USED HF AND VHF RADIOS for **RUSSIAN** Hams. Please send info by Fax (206)661-1197 or mail to: **NOVOSIBIRSK-SEATTLE INTL.** 429 So. 321st Place E 10, Federal Way WA 98003. BNB530

DACRON ROPE, WHY RISK ANTENNA SUPPORT FAILURES?? Mil Type, black, strong, high UV/stretch resistant, 3/32": $.06/ft., 3/16" (770lb. test): $.11/ft., 5/16": $.16/ft. IMMEDIATE SHIPMENT **DAVIS RF CO. 24 HOUR ORDERS:** (800)484-4002, CODE 1356. FAX (508)369-1738. BNB557

LEARN TO EARN COURSES: Electronics, robot, radio, others. Free Catalog. **A&A PRODUCTS,** Rt 1 Box 482-L, Rockdale TX 76567. BNB560

WANTED-FM unit for ICM S51D all mode 6M transceiver. Leo Schein, 32 Douglas Drive, Ocean Ridge FL 33435. (407)276-8871. BNB575

DON'T BUY QSL CARDS UNTIL YOU SEE MY FREE SAMPLES. Also I specialize in custom cards and QSL business cards. Write or call for free samples and custom card ordering information. **LITTLE PRINT SHOP,** Box 1160, Pflugerville TX 78660. (512)990-1192. Mastercard and Visa now accepted. BNB595

WANTED: Western Electric Amplifiers, speakers, tubes, etc. Toll Free (800)251-5454. BNB615

CLEANING SHACK. Want my list?! **LEWALSKI,** 3512 Moraga Blvd. #4103, Lafayette CA 94549. BNB620

160 TO 10 METERS WITH 47 FOOT LONG ANTENNA- outstanding results $39.00 PPD in 48 states—Catalog. **THE ANT FARM,** P.O. Box 3196, Wescosville PA 18106. BNB625

DUPLEXER TUNING GUIDE. A complete booklet showing step-by-step instructions on tuning all types of duplexers. Included is theory of operation, detailed diagrams and much more. Send $9.95 plus $2.50 s&h to **RGM PUBLICATIONS,** 533 Main Street, Hillsboro NM 88042. For faster service using a major credit card call (505)895-5333 and order today. 30 day money back guarantee. BNB635

SATELLITE EQUIPMENT AT 40% TO 50% OFF. Drake, Toshiba, HTS, GI, 25° LNB, $68.95; 7° Ku, $89.00. Wholesale Warehouse. Call (800)851-6534 for wholesale price list. **SATELLITE WAREHOUSE,** Tucson AZ. Fax (602)624-1629. BNB640

VHF-UHF-SHF Large SASE. **VHFer,** P.O. Box #685, Holbrook AZ 86025. BNB660

ELEGANT QSL CARDS AT LOW PRICES Samples $1 (refundable with order). **AACO,** Dept. S312, 1639 Fordham Way, Mountain View CA 94040. BNB670

HAM RADIO REPAIR- All makes and models. Fast, Professional Service. **AFFORDABLE ELECTRONIC REPAIR,** 7110 E. Thomas Rd., Scottsdale AZ 85251. (602)945-3908. BNB700

9 1/2 INCH UTC WALL CLOCK- $26.50 ppd. **GABAY TOOL CO.,** P.O. Box 68, Necedah WI 54646 BNB705

ROSS' $$$$ NEW DECEMBER (ONLY) TELEX-HI-GAIN DX-88, $241.50; 218S, $319.90; 285, $79.90; 335S, $58.00; 383, $129.90; 380S, $81.90; 393S, $520.00; CD-45II, $222.00; HAM-IV,$333.00; T2X, $397.00; KENWOOD, PHONE $; ALINCO, PHONE $; YAESU, PHONE $; ICOM IC-471H, $1,000.00; ASTRON, PHONE $; CUSHCRAFT, A147-22, $150.00; 40-2CD, $380.00; 4218-XL, $145.00; 416-TB, $78.50; A144-10T, $65.00; JERSEY SPECIALITY (J.S.C.) 500 FT. RG-213, $150.00; 500 FT. 9913, $205.00; BUTTERNUT, PHONE $. ALL LIMITED TIME OFFERS. OVER 9035 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. Preston. HOURS TUESDAY-FRIDAY 9:00 TO 6:00, 9:00-2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. **ROSS DISTRIBUTING COMPANY,** 78 SOUTH STATE, PRESTON ID 83263. (208)852-0830. BNB707

ALINCO DR570 VHF/UHF DUAL BAND MOBILE, less than one year old $465.00, Realistic HTX-100 10 meter $150.00, (I will ship). Keister Whitt, AD4JI, Route 1, Box 25, Ringgold VA 24586. (804)822-7005. BNB710

GIANT SOLAR PANELS $44.00 EACH! Excellent Prices/Solar Equipment/Accessories. Free Information/Send Stamped Envelope, Catalog $3.00. To: **QUAD ENERGY,** P.O. Box 690073, Houston TX 77269. (713)893-0313. BNB715

ELECTRON TUBES: All types and sizes. Transmitting, receiving, microwave . . . Large inventory = same day shipping. **DAILY ELECTRONICS,** 10914 NE 39th ST. Suite B-6, Vancouver, WA 98682. (800)346-6667 or (206)896-8856. BNB719

MINIATURE POLICE RADAR TRANSMITTER One mile range, $41 assembled, $31.00 kit, (219)489-1711. P.O. Box 80096, Fort Wayne IN 46898. BNB725

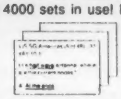
COAX CABLES! Custom built to your specifications. Choose between BELDEN 8214, 8267, 9913, 9258, 8219 and BNC, N or PL-259 connectors. PL-259 Silver Teflon, $1.25 each or 10 for $1.00 each. PL-259 Gold Teflon, $1.50 each or 10 for $1.25 each. Type N $2.75 each or 10 for $2.50 each. BNC male to UHF female adaptors $1.75 each or 10 for $1.50 each. We can supply all your adaptor, cable and connector needs. Competitive prices, quality materials and workmanship! Call or write for catalog and price list. Dealer inquiries invited. R. C. Kontes, 465 Croft, Idaho Falls ID 83401-4419. (208)522-2839. BNB730

HAM RADIO REPAIR—Prompt service. **ROBERT HALL ELECTRONICS,** 1660 McKee Rd., Suite A, San Jose CA 95116. (408)729-8200. BNB751

THERMOGRAPHED CARDS! Raised print QSLs at flat printing prices. Samples: Phone (817)461-6443 or write: **W5YI GROUP,** Box 565101, Dallas TX 75356. BNB761

QUICK, EASY, & COMPACT
Flash cards *NOVICE thru EXTRA* theory Key words underlined. Over 4000 sets in use! For beginner, OMs, XYLs & kids.

NOVICE	$11.95
TECHICIAN	$10.95
GENERAL	$9.95
ADVANCED	$15.95
EXTRA$	$14.95
Shipping	1-$3.00
2 or more	-$4.00
CLUB DISCOUNTS	



Order Today! from
VIS STUDY CARDS
P.O. BOX 17377
HATTIESBURG, MS 39404
CIRCLE 104 ON READER SERVICE CARD

Fast & Fun G5RV QuickKits™
created by Antennas West Box 50062-S, Provo, UT 84605
Fast & Easy To Build
• Fail-Safe visual instructions
• No measuring or cutting
• Everything included
• Finish antenna in minutes
Quality Components
• Presoldered Silver Fittings
• Kinkproof QuietFlex wire
• Fully insulated, wx sealed, no-corrode, low noise design
Tune All Bands Incl WARC
• Double Size G5RV 204 ft. 160-10 Dipole $59.95
• Full Size G5RV 102 ft 80-10 Dipole $39.95
• Half Size G5RV 51 ft. 40-10 dipole $29.95
• Quarter Size G5RV 25 ft 20-10 Dipole $25.95
• ReadyMade 102 ft G5RV $50.00
• ReadyMade 51 ft. G5RV/2 $40.00
• 200' Dacron 2500 line $11.95
Want Plans, Patterns, Data? Order TechNote #134-D $8.95 ppd USA
Order Hot-Line: Add 6$ P&H 1-801-373-8425
CIRCLE 296 ON READER SERVICE CARD

GET ON PACKET RADIO. . .
FAST and EASY. . .
With the "PC Packet Station" By PKT Electronics, Inc.
More than just a TNC, the "PC Packet Station" is a complete packet radio station for the IBM PC including:
- > VHF Radio Transceiver by Motorola < -
- > 1200 baud modem < - - > TNC Software < -
You just plug the PC Packet Station into a half slot in your PC, plug in your VHF antenna into the card, load the software and you're on packet, it's just that easy!
PC PACKET STATION FEATURES: * Fast, easy installation * Selectable, Com 1 through Com 4 with selectable interrupts * Built in the USA * The Radio is totally shielded from the computer * Have a custom application or a commercial use? Call us about Motorola radio modules, Motorola Telemetry Radios and Motorola Telemetry Modems. Dealer inquiries welcome.
PKT Electronics, Inc. 2668 Haverstraw Ave. Dayton, Ohio 45414 Voice and Fax 1-513-454-0242
CIRCLE 394 ON READER SERVICE CARD

SELL YOUR PRODUCT IN *73 MAGAZINE*
CALL DAN HARPER **800-274-7373**

C= TM COMMODORE/AMIGA AMIGA
COMMODORE
6526, 6510, PLA, 6567, 6581, all 901 ROMS (ea.) $9.95
C64 computer with power supply $64.50
1541 complete floppy drive with cable $64.95
1571 complete stand alone floppy drive $99.50
AMIGA
8520 ..... $9.95
8372 1MB Agnus $36.85
2.05 ROM $27.95
2.04 ROM $29.95
8373 Super Denise $25.95
A500 keyboard $27.50
A2000 keyboard $49.50
A500 power supply $29.95
A2000 power supply $89.95
Switch-Itt ROM selector $19.95
A500 computer with power supply/software (no mouse) $179.95
MegAChip 2000 with 2 MB Agnus by DKB $196.50
Send SASE For Complete List Of Commodore Surplus
THE GRAPEVINE GROUP
3 Chestnut Street, Suffren, NY 10901
ORDER LINE 1-800-292-7445
CUSTOM SERVICE: 914-368-4242
914-357-2424 Hours 9-7 ET M-F Fax: 914-357-6243
We Ship Worldwide 15% Restocking Prices Subject to Change...
CIRCLE 192 ON READER SERVICE CARD

RF ENTERPRISES
TO ORDER: 1-800-233-2482
Service & Info: 218-765-3254 Fax 218-765-3308
Complete Inventory
ANTENNAS: TELEX/hy-gain, CUSHCRAFT, DIAMOND
TOWERS: ROHN, HY-GAIN, ACCESSORIES
YAESU ICOM MFJ AEA
BELDEN COAX:
9913 Low loss; 50 ohm.
RG-213/U (8267) 50 ohm. Mil-spec.
RG-8/U (8237) 50 ohm
RG-8/U (8214) 50 ohm. Foam.
RG-8X (9258) 50 ohm; foam
Don't settle for lessthan the best
ASTRON POWER SUPPLIES
RS-4A RS-7A RS-12A
RS-20A RS-35A RS-50A
RS-20M RS-35M RS-50M
VS-20M VS-35M VS-50M
CALL US FOR YOURS!
COPPERWELD ANTENNA WIRE:
Solid: 12 ga; Solid: 14 ga.; & Stranded 14 ga. Cut to your specs.
ROTOR CABLE:
Standard (6-22, 2-18)
Heavy Duty (6-18, 2-16)
Call for used equipment
We stock Amphenol Connectors
Connectors installed! Jumpers & custom cable assemblies.
Call or write today! We ship worldwide.
VISA Mastercard
Prices subject to change without notice. Shipping additional except as noted. Returns subject to 20% restocking fee. No antenna or tower returns..
RF ENTERPRISES
HC 86 Box 580
Merrifield, MN 56465
CIRCLE 171 ON READER SERVICE CARD

Where's the **Tower?**

• No Holes • No Guys • No Damage •

Patent Pending Roof Crest Mount holds yagis, corners, parabolas, rotators, beams, wire antennas, up to 10 sq ft at 90 mph. Complete, easy to install & remove.

Antennas West Info $1
Box 50062-S, Provo UT 84605

$230 + $14 S&H
Order Hotline:
801-373-8425

CIRCLE 319 ON READER SERVICE CARD

WOLFE COMMUNICATIONS
1113 Central Ave. Billings, MT 59102
406-252-9220

OUR 20TH YEAR IS ALMOST OVER
So call today to check out our anniversary specials.
Call or write for current flyer
BUY – SELL – TRADE

CIRCLE 20 ON READER SERVICE CARD

ATV CONVERTERS • HF LINEAR AMPLIFIERS

DISCOVER THE WORLD OF FAST SCAN TELEVISION

AMATEUR TELEVISION CONVERTERS
ATV2 420–450 ..... $ 44.95 Kit
ATV3 420–450 (GaAS–FET) ..... $ 49.95 Kit
ATV4 902–928 (GaAS–FET) ..... $ 59.95 Kit

AUDIO SQUELCH CONTROL for ATV
SIL ..... $ 39.95 Kit

2 METER VHF AMPLIFIERS
35 Watt Model 335A ..... $ 79.95 Kit
75 Watt Model 875A ..... $119.95 Kit
Available in kit or wired/tested

HF AMPLIFIERS per MOTOROLA BULLETINS

Complete Parts List for HF Amplifiers Described in the MOTOROLA Bulletins.

AN758 300W $160.70
AN762 140W $ 93.25
AN779L 20W $ 83.70
AN779H 20W $ 93.10
AR313 300W $403.00
ED63 140W $ 88.65
EB37A 300W $130.20
EB104 600W $448.15
AR305 300W $383.52

NEW!! 1K WATT 2–50 MHz Amplifier

POWER SPLITTERS and COMBINERS
2–30MHz
600 Watt PEP 2–Port ..... $ 60.95
1000 Watt PEP 2–Port ..... $ 79.95
1200 Watt PEP 4–Port ..... $ 99.95

100 WATT 420–450 MHz PUSH–PULL LINEAR AMPLIFIER – SSB–FM–ATV

KEB67–PK (Kit) $159.95
KEB67–PCB (PC Board) ..... $ 10.00
KEB67–1 (Manual) ..... $ 5.00

For detailed information and prices, call or write for our free catalog.

UNIVERSAL DIGITAL FREQUENCY READOUT
TK–1 (Wired/tested) $149.95

HEAT SINK MATERIAL
Model 99 Heat Sink(6.5x12x1.6) ..... $ 22.00
CHS–6 Copper Spreader(6x6x1/4) ..... $ 18.00

We also stock Hard–to–Find parts

CHIP CAPS–Kemet/ATC
METALCLAD MICA CAPS–Unelco/Semco
RF POWER TRANSISTORS
MINI–CIRCUIT MIXERS
SBL–1 (1–500Mz) ..... $ 6.50
SBL–1X (10–1000Mz) ..... $ 7.95
ARCO TRIMMER CAPACITORS
VK200–20/4B RF Choke ..... $ 1.20
56–590–65–3B Ferrite Bead ..... $ .20
Broadband HF Transformers

Add $ 3.50 for shipping and handling.

We ship worldwide. VISA

CCI Communication Concepts Inc.
508 Millstone Drive • Xenia, Ohio 45385 • (513) 426–8600
FAX 513–429–3811

WE SHIP WORLDWIDE

CIRCLE 99 ON READER SERVICE CARD

Sell your product in *73 Amateur Radio Today*
Call Dan Harper today. . . **1-800-274-7373**

Personal Autopatch

Make and receive telephone calls from your mobile or HT with your own personal autopatch. Connect to phone line and transceiver microphone, PTT, and speaker jacks.

NEW! Now with memory backup.

- **Full duplex or simplex with courtesy beeps.**
- **Programmable local and long distance codes.**
- **Automatic CW identification.**
- **Microprocessor controlled timeout protection.**
- **Controlled by VOX or carrier detect.**
- **Regenerated DTMF or pulse dialing.**
- **Separate external remote control output.**
- **1.5"Hx4.6"Wx5.05"D shielded metal cabinet.**

Personal Autopatch SDP-600 .... **$249.95**
12Volt power adapter **11.95**

Shipping and handling $5 in US, $15 foreign.

30 day money back guarantee.
90 day warranty.

VISA

j•Com· 793 Canning Pkwy · Victor, NY 14564
(716) 924-0422 · Fax (716) 924-4555

CIRCLE 39 ON READER SERVICE CARD

JADE PRODUCTS INC.

PUTTING THE AMATEUR BACK IN RADIO

FUN-KIT LINE

NEW RELEASE

BC01 Battery Charger Kit (Lead-Acid/Gel Cel)
Uses the UC3906 IC. Cont. duty, keeps battery charged for immediate use. Only high quality components used: PCB mounted pwr xfmr, EMI line filter, ammeter, enclosure & assy manual. For 12v batteries (bulk rate 1A). Programmable for other voltages. 110/220 VAC, 50/60 Hz. $79.95

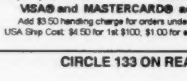
BC02 Battery Charger Module
Same as BC01 less enclosure, EMI filter & meter. Can be mounted in an existing user supplied enclosure. $39.95

BC03 Battery Charger Module
Same as BC02, minus transformer. Needs 16 - 21 VAC 50/60 Hz at 1.2 amps. $29.95

EK01, Experimenter's Kit $44.95
A prototyping kit for radio & test equip. circuits. Inc. PCB, NE602AN, MC1496, LM386, 7.5 x 8.5 x 3.5"enclosure w/hw & assy manual.

10-00001 Experimenter's PCB $12.95
11-00001 Chip Set (NE602AN, MC1496, LM386) ..... $ 6.00
31-00001 Enclosure 7.5 x 8.5 x 3.5"(hw & assy manual) $33.95
45-00001 NE602AN Mixer Oscillator $2.25ea or 6 for $10.00
45-00002 MC1496L Mixer ..... $ 3.00
45-00003 UC3906 Battery Charger ..... $ 7.50
45-00004 NE604AN IF/LIM/PHASE Detector ..... $ 6.00
45-00005 8044ABM Curtis Keyer Chip $17.95

160 METER TWIN-LEAD MARCONI ANTENNA



$39.95
Complete. Trim to length and attach coax. Takes less space than 80 M dipole. Needs no tuner. Max. pwr: 300 W./ 50 Ω

MAIL CHECK OR MONEY ORDER TO
Phone: (603) 329-6995
FAX: (603) 329-4499

JADE PRODUCTS, INC.
P.O. BOX 368
East Hampstead, NH 03826

VISA® and MASTERCARD® accepted
Add $3.50 handling charge for orders under $20.00
USA Ship Cost: $4.50 for 1st $100, $1.00 for ea. add'l $100

CIRCLE 133 ON READER SERVICE CARD

WANTED: HAM EQUIPMENT AND OTHER PROPERTY. The Radio Club of Junior High School 22 NYC, Inc. is not only the Big Apple's largest Ham club but also the nation's only full time, non-profit organization, working to get Ham Radio into schools around the country as a theme for teaching using our EDUCOM-Education Thru Communication-program. Send your radio to school. Your donated amateur or related property, which will be picked up or shipping arranged, means a tax deduction to the full extent of the law for you as we are an IRS 501 (c) (3) charity in our thirteenth year of service. Your help will also mean a whole new world of educational opportunity for children around the country. Radios you can write off, kids you can't. Tax time is just around the corner-don't wait till the last minute-Please, write-phone-or FAX the WB2JKJ ``22 Crew" today: The RC of JHS 22, POB 1052, New York NY 10002. Telephone (516)674-4072 or FAX (516)674-9600. Young people, nationwide, can get high on Ham Radio with your help. Meet us on the WB2JKJ CLASSROOM NET: 7.238 MHz. 1200-1330 UTC and 21.395 MHz. 1400-2000 daily. BNB762

SOLAR POWERED HAMS! The Sunswitch is a charge controller to protect your batteries from over charge. Power MOSFETs are used, no relays! Assembled tuned and tested. Now with Wall Mount Case, $55.00 plus $3.00 shipping. **SUNLIGHT ENERGY SYSTEMS,** 2225 Mayflower NW, Massillon OH 44647. BNB774

WANTED: CP/M Program for TNC Packet DEC VT-180 preferred but any other CP/M format can be converted. KD1ML, RR 77 Box 258B, Hancock ME 04640. BNB780

POSITION WANTED: Aggressive sales representative interested in handling amateur radio equipment. Call (919)299-1298. BNB800

WANTED: clean, unused, COAXIAL CONNECTORS, ADAPTERS, RF AND MICROWAVE COMPONENTS. **IGU,** PO Box 27849, Santa Ana CA 92799. Fax (714)553-0266. BNB810

R-390-A SALES & SERVICE, PO BOX 3541-S, TOLEDO OH 43608. BNB813

FREE SHAREWARE AND HAM CATALOG for IBM or COCO. Morse code Computer Interfaces $49.95. **DYNAMIC ELECTRONICS,** Box 896, Hartselle AL 35640. (205)773-2758, FAX-773-7295. BNB815

SENSATIONAL NEW WAY TO LEARN CODE-Do Aerobics, Sing, Jog, or **Drive** while learning code! **Now** the secret is yours! Order **THE RHYTHM OF THE CODE**-Morse code music cassette today! $9.95 ppd **KAWA RECORDS** P.O. Box 319-S, Weymouth, MA 02188. The HIT of the 1993 Dayton Hamvention! BNB824

DIGITAL SWR and **POWER METER,** Assemble, Kit, or Plans, with Alarm and Set Points. **FREE** information. **RUPP ELECTRONICS,** 5403 Westbreeze, Fort Wayne IN 46804. (219)432-3049. BNB831

FCC COMMERCIAL LICENSE PREPARATION RADIOTELEPHONE-RADIOTELEGRAPH. Latest home study fast easy audio video. Q & A pool disks. FREE details **WPT PUBLICATIONS** (800)800-7588. BNB840

VIDEO SYNC GENERATOR Restores horizontal & vertical sync lines from distorted analog video formats. For information on completed units & pricing write: **RC DISTRIBUTING,** Box 552, South Bend IN 46624, phone (219)236-5776. BNB850

ELECTRONICS GRAB BAG! 500 pieces of new components: inductors, capacitors, diodes, resistors. $5.00 postpaid. **ALLTRONICS,** 2300 Zanker Rd., San Jose CA 95131. BNB855

WANTED: COLLINS ANTIQUES, anything old from, speakers, receivers, transmitters, and all accessories, any condition. Top $$$ paid. Rick. (800)462-2972 anytime. BNB865

PRINTED CIRCUIT BOARDS for *73 Magazine, QST, ARRL Electronics Now, Nuts & Volts,* projects. US orders deduct 20%. Free list. **B-C-D ELECTRONICS,** Box 20304, 858 Upper James St., Hamilton, Ontario, Canada L9C 7M5. BNB910

WANTED: BUY & SELL All types of Electron Tubes. Call (612)429-9397, Fax (612)429-0929. **C & N ELECTRONICS,** Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. BNB915

COMMODORE 64 HAM PROGRAMS-8 disk sides over 200 Ham programs $16.95./$.29 stamp gets unusual software catalog of Utilities, Games, Adult and British Disks. **HOME-SPUN SOFTWARE,** Box 1064-BB, Estero FL 33928. BNB917

ACS NU0B BBS! Free access, over 16,000 programs. (316)251-2761. BNB923

INEXPENSIVE HAM RADIO EQUIPMENT. Send postage stamp for list. Jim Brady WA4DSO, 3037 Audrey DR., Gastonia NC 28054. BNB927

USED AND NEW AMATEUR RADIO, SWL, AND SCANNERS. We buy, sell, consign and trade used equipment. Thirty day warranty. Western Pennsylvanias' newest Amateur Radio supplier. We also offer complete repairs on most types of equipment. Call for quotes. **FOR HAMS ONLY, INC.** INFO (412)374-9744. ORDERS ONLY (800)854-0815. ROBB KE3EE. BNB929

RADIO REPAIR Amateur and commercial, professional work. Fred Fisher WF9Q, 6866 W. River Rd., South Whitley IN 46787. (219)723-4435. BNB930

SEIZED GOODS, radios, stereos, computers, and more by FBI, IRS, DEA. Available in your area now. Call (800)436-4363 Ext. C-6223. BNB940

FREE HAM GOSPEL TRACTS. SASE. **N3FTT,** 5133 Gramercy, Clifton Heights PA 19018. BNB960

QRP KITS & COMPONENTS only 2 stamps for catalog. **DAN'S SMALL PARTS & KITS,** 1935 South 3rd West #1, Missoula MT 59801. BNB964

AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur Radio & Electronics PD/shareware software $4.00 per disk. Two stamp SASE brings catalog. Specify which computer! **KD-WARE,** Box 1646, Orange Pk FL 32067-1646. BNB965

PRINTED CIRCUIT BOARDS for projects in *73, Ham Radio, QST,* ARRL Handbook. List SASE. **FAR CIRCUITS,** 18N640 Field Ct., Dundee IL 60118. BNB966

AZDEN SERVICE by former factory technician. **SOUTHERN TECHNOLOGIES AMATEUR RADIO, INC.,** 10715 SW 190 St. #9, Miami FL 33157. (305)238-3327. BNB979

COMPUTER & PRINTER USERS: SAVE! SAVE! SAVE! Renew your ribbons. Ink for 20 to 30 reinking $6.00 plus $3.00 shipping. **C & S ENTERPRISES,** P.O. Box 561, Clinton MS 39056. Sid Wilson, WB5GFM. BNB980

I BUY ELECTRON (VACUUM) TUBES Magnetrons, Klystrons, Planar Triodes, etc...Jeremy Madvin at the **VACUUM TUBE EXCHANGE.** (800)995-TUBE or fax at (800)995-6851. BNB987

ROTOR PARTS ROTOR SERVICE, ROTOR accessories: Brak-D-Lays, Quik-Connects, Pre-Set mods. NEW models for sale. Free catalog. **C.A.T.S.,** 7368 SR 105, Pemberville OH 43450. BNB996

UHF REPEATER

Make high quality UHF repeaters from GE Master II mobiles!

• 40 Watt Mobile-Radio	$199
• Duplexing and tuning information	$12
• Information without radio	$40

Versatel Communications
Orders 1-800-456-5548 For info. 307-266-1700
P.O. Box 4012 • Casper, Wyoming 82604

CIRCLE 259 ON READER SERVICE CARD

Pico-J rolls up and hides in his 4-ounce pocket-sized holder, waiting like the Genie in a bottle till you need full-quieting signal pouch.
Call him forth and his glistening black weather sealed lines reveal a sleek end-fed halfwave antenna ready to hang anywhere. Suspend in the apartment closet or patio doorway. Attach Pico-J to window glass or curtain rod. He needs no radials for broadband low-angle omni halfwave gain.
Carry Pico-J with you for emergencies. Hang in the motel when on the road. He improves range, boosts reception, saves batteries.
Pico-J comes ready for work with 72" isolated coaxial feedline and gold pin BNC. Typical edge-to-edge SWR under 1.2:1. Hand-crafted in the U.S.A.

Pico J

Info $1
Box 50062-D
Provo, UT
84605

Models
2 Meters
440MHz
Dual Band add $9

Antennas West
Order Hotline
801-373-8425

19.95 ea

CIRCLE 89 ON READER SERVICE CARD

▼ ELECTROMAGNETIC FIELD METER ▼

Reduce exposure to potentially harmful electromagnetic fields. AlphaLab's handheld TriField™ Meter measures AC electric fields, AC magnetic fields *and* radio/microwave power density. Find ground faults, AC current wires or measure high-field generators with the *Magnetic* setting (.2 – 100 milligauss, 60 Hz); identify poorly grounded or shielded equipment, high VDT or fluorescent light fields, distinguish hot vs. ground wires with *Electric* setting (.5 – 100 kV/m, 60 Hz); measure antenna radiation patterns, leaky microwave ovens, etc. on *RF/microwave* setting (50 MHz to 3 GHz, .01 to 1 mW/cm²).

Electric and magnetic settings are omnidirectional, measuring full magnitude of fields without the need to reorient the meter. Price of $145 includes delivery and one-year warranty.

AlphaLab, 1272 Alameda Ave, Salt Lake City, UT 84102 Call (801) 532-6604 for speedier service or free literature on electromagnetic radiation health risks.

Sell Your Used Gear In BARTER 'N' BUY
Call Judy Walker today. 1-800-274-7373

EVERY ISSUE of *73* on microfiche!

The entire run of *73* from October, 1960 through last year is available.

You can have access to the treasures of *73* without several hundred pounds of bulky back issues. Our 24x fiche have 98 pages each and will fit in a card file on your desk.

We offer a battery operated hand held viewer for $75, and a desk model for $220. Libraries have these readers.

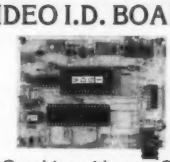
The collection of over 600 microfiche, is available as an entire set, (no partial sets) for $285 plus $5 for shipping (USA). Annual updates available for $10.

Your full satisfaction is guaranteed or your money back. Visa/MC accepted.

BUCKMASTER PUBLISHING
"Whitehall"
Route 4, Box 1630
Mineral, VA 23117
703-894-5777
800-282-5628

CIRCLE 168 ON READER SERVICE CARD

VIDEO I.D. BOARD



- Custom Graphics with your Call Sign
- 4 Screens (2 Hi-res/2 color bar)
- 12 VDC Operation
- Instant Video ID
- Video Relay for switching in Live Camera Video
- Built-in Automatic Sequencer-Timer (steps through all four screens)

VDG-1 with pre-programmed calls:
$99
Call or write for catalog of available graphics

ELKTRONICS
12536 T.R. 77 • Findlay, OH 45840
(419) 422-8206

CIRCLE 8 ON READER SERVICE CARD

Uncle Wayne's Bookshelf

REFERENCE

20N102 Practical Digital Electronics Handbook *by Mike Tooley BA* Contains nine digital test gear projects. Digital circuits, logic gates, bistables and timers, microprocessors, memory and input/output devices. **$14.50**

20N103 Electronic Power Supply Handbook *by Ian R. Sinclair* Covers many types of supplies—batteries, simple AC supplies, switch mode supplies and inverters. **$16.25**

20N104 Electronic Test Equipment Handbook *by Steve Money* A guide to electronic test equipment for the engineer, technician, student and home enthusiast. **$18.00**

20N105 Digital Logic Gates and Flip-Flops *by Ian R. Sinclair* A firm foundation in digital electronics. Treats the topics of gates and flip-flops thoroughly and from the beginning. **$18.00**

01C80 Master Handbook of 1001 Practical Electronic Circuits Tried and proven solid state circuits. **$19.95**

01P68 Pirate Radio Stations *by Andrew Yody* Tuning in to underground broadcasts. **$12.95**

01T01 Transmitter Hunting *by Joseph Moell and Thomas Curlee* Radio direction finding simplified. **$19.95**

03R02 Rtty Today *by Dave Ingram* Modern guide to amateur radioteletype. **$8.50**

05E03 First Book of Modern Electronics Unique projects that are money saving. **$12.95**

09D22 The World Ham Net Directory *by Mike Witkowski* New 2nd edition. Introduces the special interest ham radio networks and shows you when and where you can tune them in. **$9.50**

09P33 Pirate Radio Directory *by George Zeller* Where to tune in on secret entertainment stations. **$7.95**

10F093 1993 International Callbook The new 1993 International Callbook lists 500,000+ licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). **$29.95**

10D093 1993 North American Callbook The 1993 North American Callbook lists the calls, names, and address information for 500,000+ licensed radio amateurs in all countries of North America. **$29.95**

05H24 Radio Handbook, 23rd Ed. *by William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. **$39.95**

02B10 Heath Nostalgia *by Terry Perdue K8TP* 124 page illustrated history of the Heath Company. Includes many fond memories contributed by long-time Heathkit employees. **$9.50**

10DF92 1993 Callbook Supplement An update to the 1992 International and American callbooks. **$10.00**

12E76 Basic Electronics *Prepared by the Bureau of Naval Personnel* Covers the important aspects of applied electronics and electronics communications. **$10.95**

12E41 Second Level Basic Electronics *Prepared by the Bureau of Naval Personnel* Sequel to Basic Electronics, thorough treatment of the more advanced levels of applied electronics. **$9.95**

01D45 The Illustrated Dictionary of Electronics, 5th Ed *by Rufus P. Turner and Stan Gibilisco* An exhaustive list of abbreviations, and appendices packed with schematic symbols and conversion tables. **$26.95**

20N091 Most-Often-Needed Radio Diagrams and Servicing Information, 1926-1938, Volume One *compiled by M.N. Beitman* An invaluable reference for anyone involved in Vintage Radio restoration. **$11.95**

20N096 How To Read Schematics (4th Ed.) *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. **$14.95**

20N097 Radio Operator's world Atlas *by Walt Stinson, W0CP* This is a compact (5x7), detailed, and comprehensive world atlas designed to be a constant desk top companion for radio operators. **$17.95**

20N020 Secrets of RF Circuit Design *by Joseph J. Carr* Written in clear non-technical language, covers everything from antennas to transistors. **$19.50**

20N109 73 Magazine Index 1960-1990 A complete index to every article published in *73 Magazine* through 1990. Book **$15.00** IBM software (specify type) **$20.00**

20N110 Product Reviews Since 1945 Contains an index to 3,400 product reviews that have appeared in *QST, CQ, HR, 73* and *Radcom*. Book **$12.95** IBM Software 5.25 **$10.00**

SHORTWAVE

06S57 1993 Passport to World Band Radio *by International Broadcasting Services, Ltd* You'll get the latest station and time grids. **$16.50**

03S11 Shortwave Receivers Past and Present *edited by Fred J. Osterman* Guide to 200+ shortwave receivers manufactured in the last 20 years. The Blue Book of shortwave radio value. **$8.95**

07R25 The RTTY Listener *by Fred Osterman* New and expanded. This specialized book compiles issues 1 through 25 of the *RTTY Listener Newsletter*. Contains up-to-date, hard-to-find information on advanced RTTY and FAX monitoring techniques and frequencies. **$19.95**

03C09 Shortwave Clandestine Confidential *by Gerry L. Dexter* Covers all clandestine broadcasting, country-by-country: tells frequencies, other unpublished information: spy, insurgents, freedom fighters, rebel, anarchist radio, secret radio. **$8.50**

03M221 US Military Communications (Part 1) US Military communication channels on shortwave. Covers frequencies, background on point-to-point frequencies for the Philippines, Japan and Korea, Indian and Pacific Oceans, and more. **$12.95**

03M222 US Military Communications (Part2) Covers US Coast Guard, NASA, CAP, FAA, Dept. of Energy, Federal Emergency Management Agency, Disaster Communications, FCC, Dept. of Justice. From 14 KC to 9073 KC. **$12.95**

03M223 US Military Communications (Part 3) Completes the vast overall frequency list of US Military services, from 8993 KC to 27,944 KC. **$12.95**

09S42 The Scanner Listener's Handbook *by Edward Soomre N2BFF* Get the most out of your scanner radio. **$14.95**

11T88 Tune in on Telephone Calls *by Tom Kneitel K2AES* Formatted as a frequency list with detailed description of each service and its location in RF spectrum. **$12.95**

03K205 Guide to Radioteletype (RTTY) Stations *by J. Klingenfuss* Updated book covers all RTTY stations from 3MHz-30MHz. Press, Military, Commercial, Meteo, PTTs, embassies, and more. **$12.95**

11AS10 Air Scan Guide to Aeronautical Communications (5th Ed.) *by Tom Kneitel K2AES* Most comprehensive guide to monitoring US aeronautical communications. Covers all Canadian land airports and seaplane bases, plus listings for Central America, the Caribbean, North Atlantic, and the Pacific Territories. **$14.95**

07A66 Aeronautical Communications Handbook *by Robert E. Evans* Exhaustive, scholarly treatment of shortwave aeronautical listening. **$19.95**

11RF13 The "Top Secret" Registry of US Government Radio Frequencies (7th Ed.) *by Tom Kneitel K2AES* This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. **$19.95**

11F52 Ferrell's Confidential Frequency List, New Revised Edition *compiled by A.G. Halligey* All frequencies from 4 MHz-28MHz covering ship, embassy, areo, Volmet, Interpol, numbers, Air Force One/Two, more. **$19.50**

15A002 Scanner and Shortwave Answer Book *by Bob Grove* Most frequently asked questions by hobbyists. **$13.95**

11SR97 National Directory of Survival Radio Frequencies *by Tom Kneitel K2AES* Handy and concise reference guide to high interest communications frequencies required by survivalists. **$8.95**

11SM11 Scanner Modification Handbook, Vol. 1 *by Bill Creek* provides straightforward step-by-step instructions for expanding the operating capabilities of VHF scanners. **$17.95**

11EE06 Guide to Embassy Espionage Communications *by Tom Kneitel K2AES* Candid and probing examination of worldwide embassy and (alleged) espionage communications systems and networks. **$10.95**

20N094 A Flick of the Switch, 1930-1950 *by Morgan E. McMahon* Discover the fast-growing hobby of radio collecting. **$8.95**

07R26 World Wide Aeronautical Communications *by Robert E. Evans* Aircraft/Air Traffic Control, Aircraft/Company Operations, Aviation Weather Broadcasts, Aeronautical Flight Tests, Worldwide Military Air Forces, Aero Search & Rescue, Aero Law Enforcement, NASA Flight Support, Aero Terms & Abbreviations and Aero Tactical Identifiers. **$6.95**

11T89 Scanner Modification Handbook Vol. 2 *by Bill Creek* Here it is—a companion to Vol. 1. In fact, Vol. 2 has a section that provides improved approaches and updated techniques for the mods in Vol. 1. There's 18 new exciting modifications for popular scanners. **$17.95**

03R01 World Press Services Frequencies (RTTY) New 5th Ed A comprehensive manual covering radioteletype news monitoring—contains all information—antenna, receiving, terminal units, plus three extensive frequency lists. **$8.95**

SOFTWARE

04M54 GGTE Morse Tutor From beginner to Extra class in easy self-paced lessons. Code speeds from 1 to over 100 words per minute. Standard or Farnsworth mode. Adjustable tone frequency. Create your own drills, practice or actual exams. Exams conform to FCC requirements. 5 1/4" floppy for IBM PC, XT, AT, PS/2 or compatibles. **$19.50**

04M55 Advanced Edition $29.95

20N021 No Code Ham Radio Education Package Computer software package. Includes computer aided instruction software (IBM compatible). 200 page Ham Radio Handbook. **$28.95**

20N022 Ham Operator Education Package Computer software contains five IBM compatible discs with all questions for all license classes, plus "Morse Academy" code teaching software that takes you from 0-20 wpm. **$28.95**

Lanze Code Programs—(Avaliable on 5 1/4" disk.) Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, multiple choice answers, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

IBM Part#	Commodore Part#		Price
Novice	IBM01	COM01	**$14.95**
Tech	IBM02	COM02	**$14.95**
General	IBM03	COM03	**$14.95**
Advance	IBM04	COM04	**$19.95**
Extra (New Pool)	IBM05	COM05	**$19.95**

IBM06, COM06 IBM/Commodore Tech No Code—Lanze Code Program Contains all the authorized FCC questions and answers used in testing formulas, schematic symbols, diagrams, and sample test for passing the new Technician No Code license. **$24.95**

IBM97 Amateur Radio Part 97 Rules New Edition, complete FCC rules. **$9.00**

VIS Study Cards Compact, up-to-date Flash Cards with Key Words, Underlined, Quiz on back. Formulas worked out. Schematics at your fingertips. Used SUCCESSFULLY by ages 6 to 81!

NOVICE	VIS01	**$11.95**
TECH	VIS02	**10.95**
GENERAL	VIS03	**9.95**
ADVANCED	VIS04	**15.95**
EXTRA	VIS05	**14.45**

ARRL BOOKS

AR1994 **ARRL 1994 Handbook (71st Ed.)** Features: added DSP, improved treatment of Pi and Pi-L, all new all-digital-logic, plus lots more. **$25.00**

AR1993 **ARRL 1993 Handbook (70th Ed.)** 39 chapters, featuring 2,100 tables, figures and charts. Comprehensive, well organized and affordable. **$25.00**

AR1086-4 **ARRL Operating Manual (4th Ed.)** Information on how to make the best use of your station, including: interfacing home computers, OSCAR, VHF-UHF. **$18.00**

AR0194 **Antenna Compendium Vol. 1** Materials on verticals, quads, loops, yagis, reduced size antennas, baluns, Smith Charts, antenna polarization. **$10.00**

AR2545 **Antenna Compendium Vol. 2** Covers verticals, yagis, quads, multiband and broadband systems, antenna selection. **$12.00**

AR4017 **Antenna Compendium Vol. 3** More verticals, yagis, quads, plus loops, arrays, mobile, direction finding, controlled currents, computerized, installation, overloads, plus 40 new articles for beginner's to advanced. **$14.00**

AR2626 **Companion Software for Antenna Compendium Vol. 2** 5 1/4" MS-DOS floppy. **$10.00**

AR0488 **W1FB's Antenna Notebook** *by Doug DeMaw W1FB* Get the best performance out of unobtrusive wire antennas and verticals. Build tuners and SWR bridges. **$9.50**

AR0348 **QRP Notebook** *by Doug DeMaw W1FB* Presents construction projects for the QRP operator. **$9.50**

AR4141 **W1FB's Design Notebook** *by Doug DeMaw W1FB* Filled with simple practical projects that can be built using readily available components and common hand tools. **$10.00**

AR2200 **Antenna Impedance Matching** *by Wilfred N. Caron* Most comprehensive book written on using Smith Charts in solving impedance matching problems. **$20.00**

AR0402 **Solid State Design** Good, basic information, circuit designs and applications; descriptions of receivers, transmitters, power supplies, and test equipment. **$12.00**

AR3193 **Weather Satellite Handbook (4th Ed.)** *by Dr. Ralph Taggart WB8DQT* Expanded and revised to reflect today's weather-fax satellite technology. **$20.00**

AR3290 **Companion Software for Weather Satellite Handbook** 5 1/4" MS-DOS Floppy. **$10.00**

AR3291 **Now You're Talking! All You Need To Get Your First Ham Radio License (2nd Edition)** A complete study guide for the Technican and Novice written exam. Practical information every beginner needs is written clearly and simply and in small doses. **$19.00**

AR3292 **Your Introduction to Morse Code: Practice Cassettes** Kit includes two 90 minute cassette tapes. Prepares you for the 5 WPM Morse code exam to earn your Novice license or add high-frequency worldwide communications privileges to your code-free Technician license. **$10.00**

AR0437 **ARRL Repeater Directory 1993-1994** 19,000+ listings with digipeaters, bandplans, CTCSS (PL(TM)) tone chart, frequency coordinators, ARRL special service clubs, and beacon listings from 14 MHz to 24GHz. **$6.00**

AR1033 **The DXCC Companion** *by Jim Kearman KR1S* Spells out in simple, straightforward terms what you need to be a successful DXer. **$6.00**

AR1250 **Log Book**—Spiral **$3.50**

ARA341 **Interference Handbook** RFI sleuth's experience in solving interference problems. **$12.00**

AR2197 **ARRL Data Book** Valuable aid to the RF design engineer, technician, radio amateur, and experimenter. **$12.00**

AR2960 **Transmission Line Transformers (2nd Ed.)** *by Dr. Jerry Sevick W2FMI* Practical designs and specific information on construction techniques and sources of material. **$20.00**

AR0410 **Yagi Antenna Design** A *Ham Radio* series polished and expanded by Dr. Lawson. **$15.00**

AR2171 **Hints and Kinks** Ideas for setting up your gear for comfortable, efficient operation. **$8.00**

AR3169 **QRP Classics** Compilation of ARRL publications on building receivers, transmitters, transceivers, accessories. **$12.00**

ARRL **License Manuals** Complete FCC question pools with answers.

AR2375 **Technician Class**	$6.00
AR2383 **General Class**	$6.00
AR0166 **Advanced Class**	$8.00
AR2391 **Extra Class**	$8.00

AR3185 **The Satellite Experimenter's Handbook, (2nd Ed.)** *by Martin Davidoff K2UBC* Expanded and revised. Focusing on satellites built by and for the international radio amateur community. **$20.00**

AR2456 **FCC Rule Book (9th Ed.)** A must for every active radio amateur. **$9.00**

AR2030 **Your Gateway to Packet Radio (2nd Ed.)** Tells everything you need to know about this popular new mode. **$12.00**

AR2103 **Satellite Anthology** The latest information on OSCARs 9 through 13 as well as the RS satellites, the use of digital modes, tracking antennas, RUDAK, microcomputer, and more! **$5.00**

AR2083 **Complete DX'er (2nd Ed.)** *by Bob Locker W9KNI* Learn how to hunt DX and obtain hard-to-get QSL cards. **$12.00**

AR2065 **ARRL Antenna Book** The new 16th Edition represents the best and most highly regarded information on antenna fundamentals, transmission lines, design, and construction of wire antennas. **$20.00**

AR2898 **Space Almanac** *by Anthony R. Curtis KJ6XX* Recent news from space. **$20.00**

AR3293 **Morse Code: The Essential Language** *by L. Peter Carron Jr. W3DKV* Expanded and revised in its 2nd edition. How to handle distress calls heard not only on the hambands but on maritime and aircraft frequencies. **$6.00**

AR4114 **Low Profile Amateur Radio** For the Ham who lives where antennas are frowned upon. From hiding your antenna to operating with low power. This book tells you how to get on the air using these techniques—and others—without calling attention to yourself. **$8.00**

CODE TAPES

73T05 **"Genesis" $5.95**
5 wpm—This beginning tape, takes you through the 26 letters, 10 numbers, and necessary punctuation, complete with practice every step of the way.

73T06 **"The Stickler" $5.95**
6+ wpm—This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are set at 13 wpm and spaced at 5 wpm.

73T13 **"Back Breaker" $5.95**
13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language code at only 13 per.

73T20 **"Courageous" $5.95**
20+ wpm Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the extra class license. We send the code faster than 20 per.

WAYNE'S PICKS

SS8756 **Warning! The Electricity Around You May Be Hazardous To Your Health** *by Ellen Sugarman* An invaluable guide to the risks of electromagnetic fields, and steps you can take to protect yourself and your family. **$11.00**

"We The People" Declare War! On Our Lousy Government. *by Wayne Green* A "must read" for every american taxpayer. Solutions to every problem facing our government today. **$12.95**

ED86751 **Dumbing Us Down: The Hidden Curriculum Of Compulsory Schooling.** *by John Gatto* If you enjoyed "Declare War", you'll enjoy this also. A Wayne Green recommended reading.**9.95.**

78572 **How to Teach School Real Good** *by Dick Gaillard* Good reading. A true insight on the school system. What our teachers teach, how and why they teach. You will not be able to put this one down. A Wayne Green recommended reading. Limited Quantity. While supplies last. **$10.00**

NEW STUFF

AR3782 **Your QRP Operating Companion** No special rigs or expensive equipment to enjoy the excitement and challenge of low-power operating. **$6.00**

AR3959**Your Packet Companion** Perfect for the packet newcomer. **$8.00**

AR3878 **Your VHF Companion** Explore the fascinating activities on the VHF bands: FM and repeaters, packet, CW & SSB, Satellites, ATV, transmitter hunting and more. **$8.00**

ANTENNAS

20N108 **The Easy Wire Antenna Handbook** *by Dave Ingram K4TWJ.* Gives you all of the needed dimensions for a full range of easy to build and erect "sky wires." **$9.50**

10A343 **All About Cubical Quad Antennas** *by William Orr and Stuart Cowan* "The Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **$11.95**

01A70 **Practical Antenna Handbook** *by Joseph J. Carr* Design, build, modify, and install your own antennas. **$22.95**

10A342 **All About Verticle Antennas** *by William Orr* Comprehensive coverage of amateur communications. **$10.95**

10A345 **Beam Antenna Handbook** *by William Orr and Stuart Cowan* Everything you need to know about beam design, construction, and operation. **$11.95**

10A346 **Simple, Low-Cost Wire Antennas For Radio Amateurs** *by William Orr and Stuart Cowan* All New! Low-cost, multi-band antennas; inexpensive beams. "Invisible" antennas for hams in "tough" locations! New data. **$11.95**

UHF/VHF/PACKET

01P22-2 **The Packet Radio Handbook (2nd Ed.)** *by Jonathan L. Mayo KR3T* "...the definitive guide to amateur packet operation."—Gwyn Reedy W1BEL **Only $16.95**

20N019 **U.S. Repeater Mapbook** *by Robert Martin* The Guide for traveling radio amateurs. **$9.95**

09V11 **The Basic Guide to VHF/UHF Ham Radio** *by Edward M. Noll* Provides a first rate introduction to the 2.6 and 1.25 meter bands as well as 23, 33, and 70cm. **$6.50**

03R02 **RTTY Today** *by Dave Ingram K4TWJ* Most comprehensive RTTY guide ever published. **$8.50**

BOOKS FOR BEGINNERS

02D42 **Digital Novice** *by Jim Grubbs* Geared to make you a more knowledgable participant. **$8.50**

05C25 **Basic A.C. Circuits** A step-by-step approach for the beginning student. **$24.50**

20N018 **Technician Class License Manual: New No-Code** *by Gordon West* This book covers everything you need to become a Technician Class Ham. Every question and answer on the examinations is found in this one book. FCC Form 610 application. **$9.95**

20N092 **The Wonderful World of Ham Radio** *by Richard Skolnik, KB4LCS* Simple, clear, and fun. Introduces young people to amateur radio. **$7.95**

01A87 **Shortwave Listener's Antenna Handbook** Primer antenna theory. **$13.95**

20N100 **Electronics Build and Learn (2nd Ed.)** *by RA Penfold* Combines theory and practice so that you can "learn by doing." **$12.50**

20N099 **Digital Electronics Projects for Beginners** *by Owen Bishop* Contains 12 digital electronics projects suitable for the beginner to build with the minimum of equipment. **$12.50**

AR2871 **W1FB's Help for New Hams** *by Doug DeMaw W1FB* Complete for the newcomer. Put together a station and get on the air. **$10.00**

AR2286 **First Steps in Radio** *by Doug DeMaw W1FB* Series of *QST* articles. **$5.00**

Uncle Wayne's Bookshelf Order Form

You may order by mail, telephone, or fax. All payments are to be in US funds. Allow 3 weeks for delivery.

Item	Title	Qty.	Price	Total

Shipping: All US/Canada orders add $5.00 shipping. U.S. orders shipped UPS. (Please provide street address.) (Alaska & Hawaii shipped via mail.) Airmail to Canada by actual weight.

SHIPPING

TOTAL

Make checks payable to "Uncle Wayne's Bookshelf."

Foreign Orders: Shipping charges by actual weight. Surface or Airmail (Surface delivery may take 2 to 3 months.)

Name _____

Street _____

City _____ State _____ Zip _____

TOTAL $ _____ ❑Check/Money Order

❑ AE ❑ MC ❑ VISA

Card #_____ Expiration Date _____

Telephone: (603) 924-4196 (800) 234-8458
FAX: (603) 924-8613

Mail: Uncle Wayne's Bookshelf, 70 Route 202N, Peterborough, NH 03458

UW1293

Number 28 on your Feedback card

RANDOM OUTPUT

David Cassidy N1GPH

Peace

It is the time of the year when all the world's peoples contemplate brotherhood, goodwill, and peace. Maybe it would do us some good if we could stop contemplating it and start doing it. The world sure is a mess!

In the last year, the former Soviet Union narrowly missed yet another attempt by the old guard to return to the repressive policies of the past. The people of Russia are still coming to grips with the fact that freedom costs.

The beautiful country of Bosnia (formerly Yugoslavia), host to the Winter Olympics just a few short years ago, has been literally destroyed by religious and tribal bigotry. The faces of the children of Sarajevo tell the story.

Botched policy in Somalia has resulted in the deaths of several American (and other) citizens. We went there in peace to do our duty as the leader of the free world. We saved millions from certain death, and the citizens of Mogadishu have paid us back by dragging the dead bodies of American soldiers through their streets.

Haiti is exploding even as I write these words (in mid-October). Once again, the good intentions of the United States are being answered with the barrel of a gun.

The mess hasn't avoided the streets of America, either. The judicial system in the State of California has abdicated its power. The so-called "leaders" of the minority groups living in the Los Angeles area, the very ones who should be concerned with uplifting and providing opportunity for people, are the very ones who make excuses for thugs and criminals. Instead of rule of law, California has instituted rule by mob. Threats of violence and riots seem to be the ways to get what you want out of the California Courts.

This year, for the first time, terrorism reached the shores of America in the form of the bombing of the World Trade Center.

While crimes against tourists are actually on the decrease in Florida, the news media decided to create a crisis so that foreigners are now afraid to vacation here.

The anti-abortion forces in this country have escalated their message with intimidation and bullets. Can you believe this war has been going on now for 20 years?

The current ruling party has decided that the fact that Socialism has failed miserably in Eastern Europe shouldn't deter the United States from giving it a try. Clinton Administration policies (and the fear of what's next) have essentially paralyzed an already failing U.S. economy. In the name of "fairness," the American people appear to agree that they should give up some of their hard-won freedoms. There's enough pork in the barrel for both political parties, so the Republicans cannot claim any philosophical high ground, either.

Are there glimmers of hope in all this? Sure. For the first time since Moses came down from Mt. Sinai, Arabs and Israelis have met and agreed to at least try to live together without bashing each other's heads in. This is peacemaking at its most basic level. These two groups have agreed that the other has the right to exist. It ain't much, but it's a start.

"Once again, the good intentions of the United States are being answered with the barrel of a gun."

My mother is the choir director at her church. When I was young, my brothers and I all sang in her choir. One Christmastime, she taught us a song that is based on The Prayer of St. Francis of Assisi. I'd like to offer the words to this song as my holiday gift to you:

Lord, make me an instrument of your peace.
Where there is hatred, let me sow love.
Where there is injury, pardon.
Where there is doubt, faith.
Where there is despair, hope.
Where there is darkness, light.
Where there is sadness, joy.
Oh, Divine Master, grant that I may not so much seek
To be consoled, as to console,
To be understood, as to understand,
To be loved, as to to love.
For it is in giving, that we receive,
And it is in pardoning, that we are pardoned,
And it is in dying, that we are born,
To eternal life.

No matter what your religious beliefs, the truth is still the truth.

I wish you peace. Shalom. 73

Number 29 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

In spite of the decline in sunspot activity, December ought to be a Good month for propagation on the HF bands. The daily chart shows only the 12th and 13th and again the 27th to be Poor days. All the rest of the month will be characterized by many days of decent propagation . . . the first month like this in a long time. The P (Poor) days may also be accompanied by severe weather conditions.

Of course, you can't rule out an unexpected and sudden disturbance sometime during the month, but it doesn't seem likely except on the days marked P (Poor) or trending between F (Fair) and P (Poor). Times given below are LOCAL times, but the Band-Time-Country chart uses Coordinated Universal Time (what used to be called GMT).

10 and 12 meter bands: Occasional morning openings to Europe, frequent midday openings to South America and Africa, and late afternoon openings to the South Pacific and Australia. Also, short-skip openings during daylight hours between 1,000 and 2,300 miles possible on Good days.

15 and 17 meter bands: Worldwide DX during daylight hours possible on Good (G) days, with bands peaking toward the EAST after sunrise, toward the SOUTH at midday, and toward the WEST during the afternoon hours. Short skip between 1,000 and 2,300 during daylight hours.

20 meter band: Once again, this will be the top DX band for December between dawn and sunset. The band will close earlier than during summer or equinox months, but you can expect excellent daylight DX. Also, short skip beyond 500 miles will be frequent during daylight hours.

30 and 40 meter bands: These bands are expected to open to the EAST during late afternoon and early evening hours, with excellent propagation for DXers on Good (G) days. The band ought to stay open for DX during nighttime hours and close shortly after sunrise. Short skip up to 1,000 miles during daytime and beyond 1000 miles at night, when the band "goes long."

80 and 160 meter bands: You will find much DX and LOW NOISE on many days of the month, with DX peaking toward the EAST around midnight and peaking in various directions just before sunrise local time. Daytime short skip of around 500 miles on 80 meters and over 500 miles at night should prevail on Good (G) days.

On 160 meters, there will be NO daytime propagation, due to heavy absorption of signals by the ionosphere. Occasional DX between dark and sunrise should be possible on Good (G) days, but as always—QRN will be a limiting factor. Short skip up to about 1,000 miles during nighttime hours can be expected . . . sometimes even when static is heavy.

Grey-line propagation: During the hours surrounding sunrise and sunset (local time) you may be able to take advantage of grey-line skip to the parts of earth in the "fuzzy" areas between total dark and total daylight. Try all the HF bands during these times for unusual signal strength to and from unexpected areas. See you next month, W1XU. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15						20	20A	15			
AGENTINA	20										15	15
AUSTRALIA	20					40	40			20	20	15
CANAL ZONE	40	40					20	15	15	15	15	20
ENGLAND	40	40	40	80	80		20	15	15	15	20	
HAWAII	20					40	20	20			15	15
INDIA							20	20				
JAPAN	15						20	20				15
MEXICO	40	40	40	40	40	40	20	15	15	15	15	20
PHILIPPINES							20	20				
PUERTO RICO	40	40	40	40	40	40	20	15	15	15	15	20
SOUTH AFRICA	40A	40						15	15	20		
U.S.S.R.		40						15	15	20		
WESTCOAST	15	20	40	40	40	40	40A	20A	15	15	15	15

CENTRAL UNITED STATES TO:

ALASKA	20				40	40	20	20				20
ARGENTINA	20	40	40	40						15	15	20A
AUSTRALIA	15					40	20	20	20		15	15
CANAL ZONE	20		40	40	40			20	15	15	15	15
ENGLAND	40	40	80	80				15	15	15	20	
HAWAII	20	20			40	40	20	20	20	15	15A	15A
INDIA								20				
JAPAN	20				40	40	20	20				20
MEXICO	20		40	40	40			20	15	15	15	15
PHILIPPINES	20							20	20			
PUERTO RICO	20		40	40	40			20	15	15	15	15
SOUTH AFRICA	20	40	40						15	15	15	20
U.S.S.R.		40	40					15	15	20		

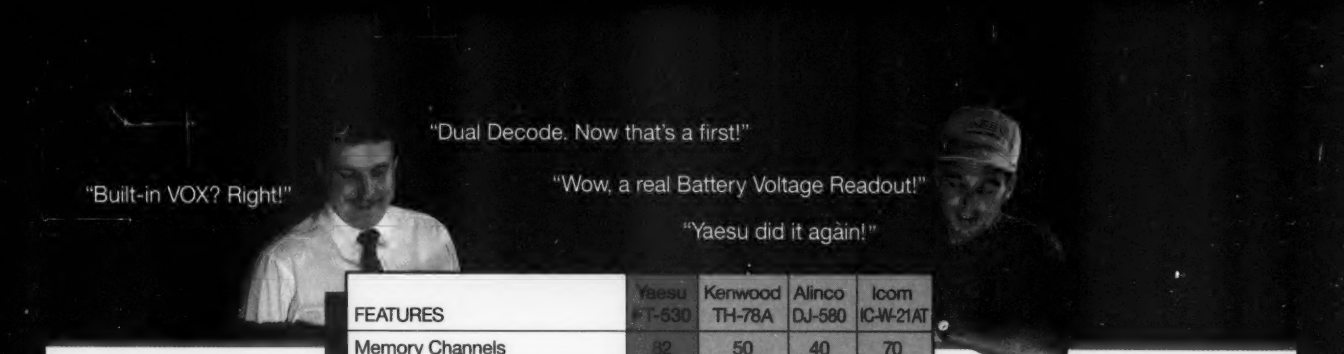
WESTERN UNITED STATES TO:

ALASKA	15	15	20			40	40	40				20
ARGENTINA	20	20		40	40						15	15
AUSTRALIA	15	15	20				40		20	20	20	15
CANAL ZONE	20	20		40	40	40	40	40	15	15	15	15
ENGLAND			40	40					20A	20A		
HAWAII	15	20	20			40	40	40				15
INDIA		20	20									
JAPAN	15	15	20				40	40	40			20
MEXICO	20	20		40	40	40	40	40				15
PHILIPPINES	20A	20								20		
PUERTO RICO	20	20		40	40	40	40	40				15
SOUTH AFRICA	20	20							15	15	15	20
U.S.S.R.								20	20	20	20	
EAST COAST	15	20	40	40	40	40	20	20A	15	15	15	15

A=Next higher frequency may also be used.

DECEMBER 1993

SUN	MON	TUE	WED	THU	FRI	SAT
			1 G	2 G	3 G	4 G
5 G	6 G-F	7 F	8 F-G	9 G	10 G-F	11 F-P
12 P	13 P	14 P-F	15 F-G	16 G	17 G	18 G
19 G	20 G	21 G	22 G	23 G	24 G	25 G-F
26 F-P	27 P	28 P-F	29 F	30 F	31 F-G	



FEATURES	Yaesu FT-530	Kenwood TH-78A	Alinco DJ-580	Icom IC-W-21AT
Memory Channels	82	50	40	70
Slide-out Lithium Battery	YES	NO	NO	NO
Dual CTCSS Decoder	YES	NO	NO	YES
Battery Voltage Readout	YES	NO	NO	NO
Automatic CTCSS Tone Search	YES	NO	NO	NO
Transmit Battery Saver (Repeater & Simplex Operation)	YES	NO	NO	NO
Built-In Vox	YES	NO	NO	NO
One Touch Reverse Button	YES	NO	NO	NO
Dual In-Band Receive (V+V, U+U)	YES	YES	NO	YES
Programmable External Speaker Audio	YES	NO	NO	YES
Optional Digital Display Mic with "S" Meter	YES	NO	NO	NO
AM Aircraft Receive	YES	YES	YES	YES

The Best vs. "the rest".

FT-530

- **Frequency Coverage:**
  2-Meter 130-174 MHz RX
  144-148 MHz TX
  70 cm 430-450 MHz RX/TX
- 4 TX Power levels:
  w/FNB-25: 2.0, 1.5, 1.0, 0.5W
  w/FNB-27: 5.0, 3.0, 1.5, 0.5W
- DTMF Paging and Coded Squelch
- AOT – Auto On-Timer with built-in clock and alarm functions
- IBS – Intelligent Band Select (provides automatic TX band select on scan stop)
- Backlit keypad and display with time delay
- Built-in cross-band repeat function
- APO – Automatic Power Off
- 5 Watts output w/ FNB-27 battery or 12 VDC
- 2 VFO's for each band
- **Accessories:**
  NC-42 1-Hour Desk Charger
  FNB-25 600 mAh Battery (2 watt)
  FNB-26 1000 mAh Battery (2 watt)
  FNB-27 600 mAh Battery (5 watt)
  FBA-12 6 AA Cell Holder
  CSC-56 Vinyl Case w/ FNB-25
  CSC-58 Vinyl Case w/ FNB-26/27
  E-DC-5B 12 VDC Adaptor
  YH-2 Headset for VOX
  MH-12A2B Speaker Mic
  MH-18A2B Lapel Speaker Mic
  MH-19A2B Mini Earpiece Mic
  MH-29A2B LCD Display Mic with Remote Functions
  MMB-54 Mobile Mounting Hanger

No other dual band handheld beats the FT-530 on features for performance and ease of use. With the largest backlit keypad available, 82 memories, exclusive Dual CTCSS Decode and AM Aircraft Receive, the FT-530 is simply the best value there is.

Compare for yourself, then forget "the rest." See your dealer for the best dual band handheld you can buy. The FT-530.

YAESU

Performance without compromise.℠

© 1993 Yaesu USA, 17210 Edwards Road, Cerritos, CA 90701 (310) 404-2700

Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

Tune Into A Sweet Deal!

Tune into special values with end-of-the-year savings on your favorite Kenwood product.

SAVE $100

TS-950SDX: An industry first! 50-volt, MOS FET final amplifier and DSP for superior linearity. 150 watts output•All-band HF transceiver with general coverage receiver•Switchable AGC, selectable IF filters with memory, dual-mode noise blankers, IF notch filter, CW reverse mode, CW pitch, SSB slope tuning, IF and AF variable bandwidth tuning•Built-in CW memory keyer (DRU-2 voice keyer optional)

SAVE $ 50

TS-850S: All-band HF transceiver with general coverage receiver, 100 watts• SSB slope tuning, CW variable pitch and reverse control, IF notch, 1-Hz fine tuning function•Superb receiver sensitivity and extremely quiet noise floor•SSB HIGH BOOST function to bust through the pile-ups•Filter options for both first and second IF sections•Built-in CW memory keyer (DRU-2 voice keyer optional)

SAVE $ 50

TS-450S: **All-band** HF transceiver with general coverage receiver,100 watts •Wonderfully easy to use, yet high-performance package•Filter options for superb receiver performance

SAVE $ 30

TS-50S: An exceptional compact, all-band HF transceiver, with 500 kHz to 30 MHz receiver. 100 watts. DDS with "fuzzy logic" control. Kenwood's Advanced Intercept Point (AIP) ensures top performance with reduced noise floor

SAVE $ 20

TM-241A: Wide band receiver coverage•CTCSS encode built-in•Three power settings: 5, 10, and 50 W•20 full-functio memory channels store everything you need•Multiple scanning functions

SAVE $ 30

TM-732A: 50 watts on 2m, 35 watts on 70cm•Wide coverage receiver•CTCSS encode built-in, decode optional•50 memory channels•Unique S-meter squelch•Remote controllable via DTMF

SAVE $ 30

TM-742A: 2m, 50 watt/70cm,35 watt modular FM transceiver•101 memory channels for each band•CTCSS encode built-in•Wide band receiver•Optional modules for 28, 50, 220, or 1200 MHz•Remote-mountable front panel

SAVE $ 20

TH-28A: •2m pocket HT, 2.5 watts outpu •Sub-receiver for 70cm band•Alpha numeric disp and message paging•CTCSS encode/decode built-in•Wide band receiver•40 memory channels

SAVE $ 20

TH-78A: Full duplex cross-band operation•CTCSS encode/decode built-in•Alpha numeric display and message paging•Wide band receiver •50 memory channels • Sliding keyboard cover and illuminated keypad

KENWOOD

KENWOOD COMMUNICATIONS CORPORATION
Amateur Radio Products Group
P.O. Box 22745, 2201 E. Dominguez Street
Long Beach, California 90801-5745

©Copyright 1993 Kenwood Communications Corporation
All rights reserved

93ARD-0756

Cut Your Own Deal !!

To our customers: **PRESENT THIS COMPLETED COUPON AT THE TIME OF PURCHASE TO YOUR AUTHORIZED KENWOOD AMATEUR RADIO DEALER FOR YOUR DISCOUNT.** This coupon may be used only for the Kenwood models listed here, for the appropriate discount indicated. This coupon is not good for cash. Offer good only at authorized dealers.

To authorized Kenwood dealers: Indicate the radio purchased and discount amount. Send this coupon, along with a copy of the sales receipt, to Kenwood Communications Corporation.

NAME

ADDRESS

CITY, STATE, ZIP

PHONE

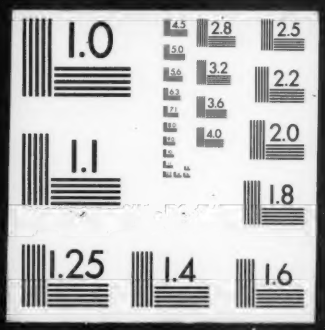
Please check model purchased & discount

__TS-950SDX	$100 off	__TM-732A	$ 30 off
__TS-850S*	$ 50 off	__TM-742A	$ 30 off
__TS-450S*	$ 50 off	__TH-28A	$ 20 off
__TM-241A	$ 20 off	__TH-78A	$ 20 off
__TS-50S	$ 30 off		

*With or without Tuner

Coupon offer valid in USA only; void where prohibited. This coupon has no cash value. **COUPON MUST BE FILLED OUT BY CUSTOMER and PRESENTED TO AN AUTHORIZED DEALER TO BE VALID.** Not valid with any other offers or discounts. Coupon offer valid between October 20 and December 31, 1993 only.

Redeem With Authorized Dealer


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3